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HEADQUARTERS
UNITED STATES STRATEGIC AIR FORCES IN EUROPE
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Air Staff Post Hostilities Intelligence
Requirements on German Air Force

Aviation Medicine
Section IX

This report covers the subject of the Medical Services of the German Air Force, and has been prepared in compliance with the requirements of Section IX of the Air Staff, Headquarters, AAF, Post Hostilities Intelligence Requirements. The following officers attached to Hq. USSTAF, from Hq. AAF, for this purpose, have participated in the preparation of such report:

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OUTLINE AS SET FORTH BY THE AIR STAFF.

IX. AVIATION MEDICINE.

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2. Method of processing physical examinations of flying personnel.
3. Reviewing authority on all physical examinations affecting flying personnel.
4. Oxygen equipment.
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 - b. Type and design of oxygen installation in various airplanes.
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 - a. Principles involved and design and material used.
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1. Major problems and procedures of selection and classification of air crew personnel by means of aptitude.
2. Selection and classification of personnel.

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- IX* a. Personnel for jet and rocket propelled planes.
b. Personnel for long range fighter pilots.
c. Personnel for air crew commanders.
d. Personnel for airborne radar operators.
B* e. Initial procedures selecting personnel as air crew candidates, fighter pilots, bomber pilots, navigators, bombardiers, radio operator gunners, air mechanic gunners, armament gunners, career gunners, and radar operators.
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4. Statistical procedures used in scoring of the individual tests.
5. Statistical procedures employed in arriving at the final scores by which aptitude is measured.
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- IX* a. Statistical statement of results obtained.
B* b. Description of procedures employed in evaluating combat effectiveness, such as obtaining ratings from squadron leaders and employing bombing accuracy records.
B* c. Description of statistical procedures employed in evaluating data.
d. Steps taken to revise selection tests and develop new screening procedures on this basis of training and combat validation studies.

C. Medical Personnel.

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2. Relationship between G.F. Medical Service and that of the Army, Navy, Public Health Service, Veterans Administration, and other government agencies.
3. Relationship between G.F. Medical Officers and university medical clinics, etc.
4. Training policy with regard to medical enlisted personnel.
5. Training with regard to physiology, psychology, sanitary officers, veterinary officers, dieticians, physical therapy, nurses, etc.

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D. Hospitalization.

1. Policy with regard to hospital construction on air bases both in the combat areas, communication zone and zone of interior.
2. Basic policy regarding the number of hospital beds required.
3. Utilization of hospitals assigned to the Navy, Army, or other government agencies.
4. Establishment of special clinics and examining units exclusively for aviation medical problems.
5. Specialized hospitals in the zone of interior.
6. Provisions for convalescent hospitals and rehabilitation hospitals in the zone of interior.
7. Relationship between the Air Forces and the civilian agency in placing handicapped veterans in aircraft industry, etc.
8. Relationship between civilian agencies and GAF with regard to veterans.

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1. Responsibility for the development and operation of the air evacuation service as well as the tactical units and medical units employed.
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1. Responsibilities for medical reports of all types.
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1. Airplane Movement.
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3. Rest and Convalescent Areas.
4. Quarantine Measure.
5. Insecticides, Drugs, etc.

H. Medical Service Organization.

1. Relationship between GAF doctors and GAF Commanders.

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2. Organization of the medical service in the various echelons of command.
3. Medical personnel assigned to tactical units.
4. Agency in G.F. responsible for sanitation, hygiene and military government.

I. Relationship between Aviation Medicine and Flying Safety.

1. Role of medical officer in accident investigation.
 - a. Methods and forms used.
 - b. Scope and purpose of report.
 - c. Report channels.
2. Use of medical investigation analysis and research in safety work.
3. Medical methods used to prevent accidents.
4. Medical methods used to prevent injuries in crashes, bailing out and ditching.
4. Protective equipment and efficiency thereof.
 - a. Shoulder harness.
 - b. Harness locks.
 - c. Seat specifications.
 - d. Seat belts.

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ACTUAL OUTLINE.

The outline as set forth by the Air Staff has been rearranged and altered to some extent largely for the purpose of expansion and simple categorization.

1. General Statement.
2. Organization of the German Air Force Medical Services.
 - a. Relation to the Wehrmacht.
 - b. Relationship of the Surgeon General of the G.F. to the Luftwaffe Staff.
 - c. Organization of the Staff of the Surgeon General of the G.F.
 - d. Chain of Command in Operation and Administration.
 - e. Medical Manning.
3. Medical Department Personnel.
 - a. Recruiting and Induction.
 - b. Classification.
 - c. Administration and Assignment.
 - d. Ranks, Grades and Promotions.
4. Professional.
 - a. Major Infectious Diseases.
 - b. Interesting Observations Concerning the Diseases Listed.
 - c. Immunizations.
 - d. Sanitation and Hygiene.
 - e. Dental Service.
 - f. Veterinary Service.
 - g. Physical Standards.
 - h. Care of Flying Personnel.
5. Training of Medical Service and Affiliated Personnel.
 - a. Training of Regular German Air Force Medical Officer.
 - b. Specialized Training of German Air Force Medical Officers.
 - c. Other Schools Conducted for Luftwaffe Medical Personnel.

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- d. Training of Medical Department Enlisted Men.
- e. Medical Training of Flying Personnel.
- f. Altitude Training Program.
- 6. German Air Force Hospitals.
 - a. General Statement.
 - b. Hospital Planning.
 - c. Hospital Construction.
 - d. Internal Organization of GAF Hospitals.
 - e. Specialized Hospitals.
 - f. Convalescent Hospitals (Kurlazarett).
- 7. Air Evacuation.
 - a. General.
 - b. Organization.
 - c. Equipment.
 - d. Operation.
- 8. Medical Reports.
 - a. General.
 - b. Basic Report.
 - c. Specific Medical Reports.
- 9. Flying Safety.
 - a. Investigation and Coordination.
 - b. Safety Aspects of Aeronautical Design.
 - c. Aircraft Accident Report.
 - d. Disposition of Accident Reports.
 - e. Classification of Accidents.
 - f. Frequency of Types of Accidents.
 - g. Correlation of Physical Standards.
 - h. Flying Safety Training.
 - i. Research on Flying Safety.
- 10. Aviation Psychology Program.
 - a. Introduction.

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- b. Development of Psychology in the German Armed Forces.
 - c. Development of Aviation Psychology.
 - d. Organization.
 - e. Personnel.
 - f. Relation to Other Branches.
 - g. Tests.
 - h. Principles of Psychological Testing.
 - i. Test Administration Procedures.
 - j. Final Recommendations.
 - k. Research in Psychology.
11. Neuropsychiatry.
- a. Organization.
 - b. Training.
 - c. Selection.
 - d. Fatigue, Combat-Fatigue, Anxiety Reactions and Psychoneuroses.
 - e. Neurology.
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- a. General.
 - b. Suicide.
 - c. Medical Officers for Mental Hygiene.
 - d. Military Courts.
 - e. Morale at the End of the War.
13. Aero-Medical Research in the G/F.
- a. Scope.
 - b. Fundamental Research.
 - c. Organization of Aero-Medical Research Facilities.
 - d. Budget.
 - e. Facilities for Research.
 - f. The Type of Research.

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- g. Altitude Acclimatization.
 - h. Treatment of Shock Following Prolonged Exposure to Cold by Rapid Rewarming.
 - i. The Paradox Effect.
 - j. Study of Time Periods Flying Personnel can Remain at Extreme Altitudes with 100% Oxygen.
 - k. Speed in Air War and Physiological Latent Period.
 - l. Night Vision.
 - m. Use of Aluminum Impregnated Cloth for Fire Protective Clothing.
 - n. Research on Insecticides.
 - o. Research of Infectious Hepatitis.
 - p. Research in Malaria Prophylaxis with Drugs.
 - q. Cause of Death in Animals Following Simulated Long Range Parachute Drops.
 - r. Bacteriological Warfare.
 - s. Use of Long Metal Pins in Treatment of Fracture of Long Bones.
 - t. Bombing Deaths.
 - u. Vibration Effects.
 - v. Electroencephalography.
14. Personal Equipment.
- a. Belts & Harnesses.
 - b. Anti-G Suit.
 - c. Oxygen Equipment.
 - d. Ejectable Pilot Seat.
 - e. Ribbon Parachute.
15. Nutrition.
- a. Garrison Rations.
 - b. In-Flight Meals.
 - c. Emergency Rations.

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16. Aero Medical Intelligence.

- a. German Knowledge of American Research.
- b. Japanese and German Medical Cooperation.
- c. Progress of Japanese Aviation Medicine.

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SUMMARY, CONCLUSIONS AND RECOMMENDATIONS.

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S E C R E T

1. SUMMARY.

a. In the attached report an attempt has been made to present a picture of the organization and function of the Medical Service of the German Air Force during World War II. Certain of the aspects of the subject are treated graphically and in detail in the appendices.

b. This study is the result of investigation performed by a team of six officers assigned to the project by the Air Surgeon. The groundwork was laid in the United States through the consultation of documents and individuals of experience. The Group was then sent to the European Theater of Operations to extend and continue its studies under the guidance of the Assistant Chief of Staff, Intelligence and the Surgeon, Headquarters, United States Strategic Air Forces in Europe.

c. During the course of the investigation various high Staff Officers as well as many personnel of the lower echelons of the Medical Service of the German Air Force, were interrogated. Trips were made to important hospital installations, research establishments, universities, medical schools, industrial concerns, airfields and aviation research centers. A list of the major installations visited, documents consulted and the personnel interrogated, is attached.

2. CONCLUSIONS.

a. It is the opinion of this Group that with the exception of a few isolated instances the organization and the function of the Medical Service of the German Air Force was inferior to that of the United States Army Air Forces.

b. In general, the organization of the Medical Service of the German Air Force closely paralleled that of the American Air Force. However, there were three major points worthy of note.

- (1) The Wehrmacht (overall German Military Command, encompassing the Army, Navy and Air Force) had, at a high staff level, a Surgeon General. The three Surgeon Generals, those of the Army, Navy and the Air Force, were under him from the standpoint of overall policy and for the purpose of coordination of the various professional functions of the three services.
- (2) The Surgeon General of the German Air Force had jurisdiction of all hospitals in the German Air Force areas. These included hospitals in combat zones.
- (3) The Surgeon General of the German Air Force, during the last phase of the war, functioned through the Quartermaster General and was not directly under the Chief of Staff.

c. The first two points mentioned above are worthy of consideration and study. With reference to the third point the

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staff relationship of the Air Surgeon of the American Air Force to the Chief of Staff is considered superior to the staff relationship of the Surgeon General of the German Air Force.

d. A seniority list for the promotion of officers as well as a closely followed policy of a minimal period in grade, did much to keep up the morale of German medical officers.

e. The elastic Table of Organization, field and fixed organizations, whereby an eligible individual might be promoted to the next higher grade irrespective of the existence of a position vacancy, also helped morale.

f. The maintenance of highly trained medical personnel and other professionally trained individuals in officer status, of administrative officers on semi-officer lesser pay status, and of nurses and medical technicians on civilian status, placed each of the specialized groups in a proportionally equitable position.

g. In the professional care of personnel there was little that the German Air Force employed that was not equalled or bettered by comparable American Army professional services. The lack of penicillin was most keenly felt by the hospital staff and it was particularly missed in the treatment of Gonorrhea. The hospital status treatment of all Venereal Diseases by the Medical Service of the German Air Force seemed particularly to result in wasted manpower.

h. From the standpoint of disease control Malaria, Typhus, Venereal Disease and, to a lesser extent, Infectious Hepatitis, seemed to have offered the greatest problems to the German Air Force. In the civilian populations, Scarlet Fever, Diphtheria and Pulmonary Tuberculosis, were of greatest concern. Epidemics of respiratory diseases were never a menace.

i. Physical standards for flying duty were much less rigid than those of the American Air Force. At the discretion of the examining surgeon defects might be waived and a candidate accepted for flying training, or a trained flier continued in flying duty despite relatively major defects.

j. Care of flying personnel was centralized in specialized medical installations remote from actual bases of operation. This frequently resulted in the disadvantage of lack of constant observation of flying personnel by a medical officer trained and experienced in Aviation Medicine as well as in the early initiation of preventive measures in the care of fliers.

k. Training of medical officers in aviation medicine was poorly organized, consisting of brief courses held at irregular intervals at various research centers. However, frequent meetings were held whereby an effort was made to keep medical officers who had been trained in Aviation Medicine, well informed concerning recent advances in their field.

l. Air evacuation was well organized and used extensively with excellent benefit to the Army.

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m. The medical aspects of Flying Safety were thorough and well organized.

n. The organized care of neuropsychiatric casualties in the German Air Force was efficient. However, there was a very definite shortage of psychiatrists especially of trained psychotherapists. Neuropsychiatric selection on the basis of personality seemed to have been intelligently handled and not ruled by rigid regulation.

o. Flying fatigue, combat fatigue, anxiety reactions, and psychogenic disturbances occurred and presented problems. In research and therapy emphasis was placed on the organic aspect of these disorders. The utilization of specially trained psychiatrists as Mental Hygiene and Morale Officers in all probability did not free military personnel from emotional conflict disturbances. This is exemplified in the large incidence of psychosomatic disease, abnormal behaviour and suicide. However, no evidence that weakness of morale in the German Air Force had contributed to the defeat of Germany, could be elicited.

p. Neurosurgical care of casualties from brain injuries, and their after-care, seemed to have been an excellent development. The increased incidence of neuritis as a complication of various diseases, insufficiently explained but evident, rendered diphtheria and typhus problems of neurological importance.

q. The German conception of Aviation Medicine was very broad. It embodied all phases of the care, physical, mental and psychological, of the personnel of all categories of the German Air Force.

r. The scope of German Air Force Medical Research was also very broad. Their research program, in addition to the usual aviation medical subjects, included investigations of many diseases such as Malaria, Typhus and Infectious Hepatitis, as well as subjects such as bomb injuries, the psychological effects of terror bombs, the psychological aspects of gun sighting, development of gun sights etc. If a problem developed relative to the care of German Air Force personnel or to the tasks they performed, the Surgeon General of the G.F. was free to direct any research that he felt necessary.

s. German Aviation Medical Investigators, except in a few instances, did not appear to apply such rigid controls to their experiments as have been demanded by American ideals of scientific approach.

t. Several German electrophysical laboratory techniques were excellent, and can be applied to American studies. Among these techniques is the magnetic oxygen analyser developed by Prof. Rein of Göttingen.

u. In general, German Aviation Medical investigators were extending their studies to greater extremes of speed, altitude, accelerative forces, etc., than has been the case among American investigators.

v. Among the most interesting research performed were the investigations concerning altitude acclimatization, re-warming

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of individuals who were in a state of shock following prolonged exposure to cold, the paradox effect, time periods that flying personnel can remain at extreme altitude, DDT paint, aluminium impregnated clothing for fire and heat protection, ejection parachute seats, and those concerning parachutes which allow slow deceleration during opening.

w. The Germans had developed a DDT paint which is described in the body of this Report. The paint is easy to apply and for a period of 8 to 12 weeks kills flies and mosquitoes.

x. An extensive psychological testing procedure for the selection of G.F. officers, and for the selection and classification of specialists, existed from the time of the creation of the Luftwaffe until February 1942, on which date the entire program was discontinued. This program was administratively separate from the G.F. Medical Service.

y. Psychological testing, as it existed prior to 1942, was very thorough. As many as three days were devoted to the examination. Examiners attempted to evaluate the total ability and personality of the candidates. There was no uniform objective method of administering and scoring tests or of arriving at numerical aptitude ratings.

z. No uniform procedure existed for securing follow-up data or for validating the psychological testing procedures. Modern methods of statistical analysis were not employed. The net result was that little or no worthwhile research data on selection tests were accumulated.

3. RECOMMENDATIONS.

a. It cannot be recommended that any broad changes be made in the organization or function of the Medical Service of the A.F. as a result of the Study. However, certain of the conclusions listed above and certain factors brought out in the body of this report should be studied for possible application.

b. Several Aviation Medicine research projects which were being carried on in Germany at the end of the war are concerned with important problems of direct interest to the A.F. In view of the possibility of securing unique and valuable findings, it is recommended that a number of these research studies be completed under direction of A.F. officers.

c. The use that the Surgeon General of the G.F. made of outstanding research specialists, allowing these men to continue work in their own laboratories but with official status in the G.F. medical research program, offers many advantages. It is recommended that this plan be studied, especially with respect to the post war medical research program of the A.F.

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B O D Y O F R E P O R T

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1. GENERAL STATEMENT

a. This report embraces an attempt to construct a picture of the organization, the function and chief activities of the Medical Service of the German Air Force during World War II. In compiling it the authors have tried to maintain strict objectivity.

b. The structure and policy of the GAF was quite flexible and was varied from time to time to meet military demands. The structure and policy found to have been pursued one year was not always applicable to other years. The picture therefore of necessity is a general one. Furthermore, it is the impression of this group that the Medical Service of the GAF did not depend to any great extent upon a well defined set of regulations. Emphasis seems to have been placed upon the careful selection of men for key positions and then these men were depended upon for interpretation and enforcement of policy. Consequently, the procedures followed by one man varied at times from those followed by others in similar position. This factor has also made it difficult to deal other than in general terms with certain subjects discussed in this report.

2. ORGANIZATION OF THE GERMAN AIR FORCE MEDICAL SERVICES

a. Relation to the Wehrmacht

- (1) The Wehrmacht contrary to rather common impression was the highest overall German military command, encompassing all three services - the Army, the Navy and the Air Force.
- (2) On a high staff level of the Wehrmacht there was an office of Wehrmacht Sanitätsinspektion (Surgeon General of the Wehrmacht) who formulated and directed overall medical policies for all three services of the Wehrmacht, namely, the Army, Navy and Air Force. In respect to medical matters he had command jurisdiction over the Surgeon General of the three services under him.

b. Relationship of the Surgeon General of the GAF to the Luftwaffe Staff.

- (1) The medical service of the German Air Force was reorganized several times from 1939 to 1945. This was in keeping with the reorganization of the Luftwaffe as a whole. The last reorganization placed the Chef des Sanitätswesen (Surgeon General of the GAF) under the Quartermaster General who in turn was under the Chief of Staff. A history of the development of the medical services as given by the Surgeon General of the GAF is attached as Appendix I. The Quartermaster General of the Luftwaffe differs from the Quartermaster General of the U.S. Army in that he had many

of the functions of G-2 and G-4 of the Army General Staff besides having under his jurisdiction the GAF Engineers and GAF Ground Forces.

- (2) The functions of the Quartermaster General together with complete organizational charts are being reported in detail by the Personnel and Management Control Sections of the Exploitation Team A-1, US Strategic Air Forces in Europe. Attached in Appendix II is an abbreviated Organizational chart of the Luftwaffe showing the staff position and various relationships of the Surgeon General to other functions of the German Air Force.

c. Organization of the Staff of the Surgeon General of the GAF.

- (1) In spite of the organization as shown, the Surgeon General of the GAF was given relatively free rein on all medical matters. All administrative matters such as construction of hospitals and supply were taken up with the Quartermaster General, whereas all important medical matters requiring final decision were taken up with the Supreme Commander of the GAF or his Chief of Staff.
- (2) The Staff of the Surgeon General consisted of the Surgeon General, a Chief of Staff, and Chiefs of four departments, each department having a number of divisions. The four departments were: Department A, Organization; Department B, Medical Professional Services; Department C, Air Raid Protection; and Department D, Administrative Board.
- (3) The Department of Organization was divided into three main sections, namely, a) Organization and Operation, b) Personnel and c) Supply. The Department of Medical Professional Services was also divided into three sections, a) Convalescent and Hygiene, b) Aviation medicine, and c) Statistics. The Air Raid Precaution Department had a subdivision for protection against gas which formulated plans for gas protection, in addition to protection against bombs and fire. The Administrative Board Department took care of finance and budget of the GAF Medical Service insofar as the Surgeon General of the Luftwaffe was responsible. This department also cared for local office necessities.
- (4) The Organization and Functional chart of the Surgeon General's office of the GAF is attached as Appendix III.

d. Chain of Command in Operation and Administration.

- (1) Below the level of the Surgeon General of the GAF were the surgeons of the Luftflotten (Air Force), Fliegerkorps (Divisions), Luftgau's (Service Commands), and Gruppen (Groups). The Flakkorps was on an equal level with the Fliegerkorps. A chart showing the chain of command at various levels is attached as Appendix IV. It will be noted that no surgeons were assigned to the Geschwader (Wings) and only Medical Department enlisted men were assigned to the Stäffeln (Squadrons).
- (2) Germany was divided into a number of Luftgau headquarters and as more territories were conquered Field Luftgaus were established in the newly acquired territory. In general, the Luftgau had jurisdiction and responsibility over all permanent GAF hospitals in the Zone of Interior and over the field GAF hospitals in their respective domains.
- (3) A further breakdown of the organization of specific functions such as research will be found in later chapters of this report.

e. Medical Manning.

- (1) Luftflotte headquarters : The manning of the office of the surgeon of a Luftflotte headquarters included seven medical corps officers. Their specific assignments were as follows: the senior surgeon; an adjutant who took care of administration and was in charge of personnel; a flying accident officer; a medical officer who held sick call for the headquarters personnel; and three consultants, one each in internal medicine, surgery and sanitation and hygiene. The surgeon held the rank of Generalarzt. Total personnel of the headquarters numbered about 3,000 individuals.
- (2) Luftgau headquarters : The staff of the surgeon of the Luftgau headquarters consisted of six medical officers who were respectively the surgeon, the adjutant, the convalescent and rehabilitation officer, the sanitation and hygiene officer, the plans and organization officer, and the medical officer who held sick call for headquarters personnel. In addition there was one dental corps officer, one administrative officer and one pharmacist who controlled supply. Personnel of the Luftgau headquarters were about 1,000 in number. The surgeon held the rank of Generalarzt or Oberstarzt (Colonel).
- (3) Fliegerkorps headquarters : The surgeon's

staff of the Fliegerkorps consisted of the surgeon, an adjutant and a doctor assigned for care of headquarters personnel. The strength of the Fliegerkorps headquarters was about 1,000. The surgeon held the rank of Oberfeldarzt (Lt. Colonel).

3. MEDICAL DEPARTMENT PERSONNEL.

a. Recruiting and Induction.

- (1) Enlisted personnel of the German Air Force Medical Department were obtained through the Luftgau Recruiting Centers (Annahme und Entlassungstellen) where all individuals were called up for active service. They received regular basic training under jurisdiction of the Luftwaffe as did all inductees entering the GAF. Subsequent to the basic training they were sent to various service schools through the different Luftgau for specialized training in medical subjects.
- (2) Medical and Dental officer personnel were obtained from two sources, first from those students trained under the supervision of the medical training department of the Luftwaffe and second from graduates of other medical and dental schools called to active service.
- (3) Veterinary officers were for the most part officers who had had service with the Army and had been transferred to the Air Force.
- (4) Administrative officers or Beamte who performed functions of administration, and the keeping of statistics were for the most part obtained from long service enlisted men.
- (5) Civilian specialists such as Nurses, X-Ray and Laboratory technicians, and Anesthetists were allotted by quote to each of the three services, (the Army, the Navy and the Air Force) from the limited supply of such specialists completing civilian training.

b. Classification.

- (1) Officer personnel, Major classification of officer personnel with the approximate number of such personnel as of January 1945 was as follows:

Medical Officers	6070
Dental Officers	1418
Pharmacy Officers	250
Administrative Officers	250
Tactical Officers	40

Records were maintained in the office of the Surgeon General and in each Luftgau Surgeon's office concerning specialized training of each medical officer, but no attempt was made to classify them into specialty serial numbers such as in the Medical Department of the United States Army.

- (2) Enlisted personnel. The number of enlisted personnel in the Medical Department fluctuated considerably during the period of the War. As the need for more combat soldiers developed in 1943 and 1944 large numbers of enlisted men were required to be transferred to combat troops. These were replaced as well as possible by physically unfit enlisted men and by civilians.

c. Administration and Assignment.

- (1) Assignment of medical personnel was administered in the office of the Chief of Personnel, Luftwaffe General Staff (O.K.L.). A medical officer assigned to this office processed personnel work concerned with the Medical Department, coordinating all important matters with the Surgeon General of the Luftwaffe. However, personnel in scientific work were assigned directly by orders published in the Surgeon General's office. It was the general policy of the Surgeon General to continue medical officers engaged in a professional specialty in the same hospital facility and to rotate frequently those assigned to tactical organization and staff headquarters.

d. Ranks, Grades and Promotions.

- (1) Officers' ranks can best be understood by tabulating with the American army equivalent and the approximate period an officer remained in grade:

<u>USAAF</u>	<u>GLF</u>	<u>Time in Grade</u>
Cadet	Unterarzt	1 - 2 years
2nd Lieutenant	Assistenzarzt)	
1st Lieutenant	Oberarzt	3 years
Captain	Stabsarzt	5 - 6 years
Major	Oberstabsarzt	4 - 5 years
Lieutenant Colonel	Oberfeldarzt	3 years
Colonel	Oberstarzt	4 years
Major General	Generalarzt	2 - 3 years
Lieutenant General	Generalstabarzt	
General	Generaloberstabsarzt	

- (2) Promotion in the medical service was constant and parallel to promotion in the line, usually being determined by length of service. Cadets (Unteraerzte) were required to have front

line field service prior to consideration for promotion to officer grade. Promotion of medical officers was controlled by the Surgeon General although all recommendations for promotion were sent through command channels and processed in the Personnel Section of the General Staff.

- (3) Enlisted grades are comparable to those of the U.S.A. Medical Department although occupancy of technical specialist positions by civilians made less necessary the procurement of highly intelligent and proficient individuals in the medical service. Promotion of enlisted personnel was controlled at organization level.

4. PROFESSIONAL.

a. Major infectious diseases. The incidence of the diseases which have been a concern to the Surgeon General of the Luftwaffe are best demonstrated by graphs attached as Appendix V. These give rates per 1,000 troops per month and actual number of cases for all tactical organizations of the entire Luftwaffe from the 1st of September, 1939, thru July, 1944 for the following diseases:

Malaria
Typhus
Typhoid & Paratyphoid fever
Bacillary Dysentery
Gastro-enteritis
Pulmonary and Pleural Tuberculosis
Syphilis
Gonorrhea
Diphtheria
Scarlet Fever
Skin Diseases

b. Interesting observations concerning the diseases listed above as well as other common diseases have been obtained from various medical officers of the Luftwaffe hospitals and tactical organizations.

- (1) Malaria was constantly a problem in Southern Russia, Italy, the Balkans and Africa and much effort was expended in its control. Extensive research was made in the study of prophylactic drugs, inmates of an insane hospital in Muhlhausen being used in this experimental work. Atabrine in doses of 0.6 grams daily was considered to be the most effective prophylactic drug studied. Excessive rate of Malaria as shown in Appendix V are partially due to the reporting of recurrent cases as an original incidence as well as to the relaxation of Malaria discipline with progressive military confusion occurring toward the end of the war.

- (2) Typhus was also a problem in the Balkans and on the Eastern Front. Typhus vaccine not being available in sufficient quantity to administer to all troops. Much time and effort were given to problems of sanitation and insect control and to the indoctrination and training of troops in personal hygiene. The occurrence of Typhus was much greater in the Army, in the civilian population and in prisoners of war than in Luftwaffe troops. The low incidence in the Luftwaffe as compared to the Army was credited to the direct medical supervision of insect control in the Luftwaffe in contrast to the line or administrative supervision in the Army.
- (3) Infectious Hepatitis known as Hepatitis Epidemica was endemic on the Eastern Front, beginning in September each year. Outbreaks also occurred in North Africa and Libya during 1942 and 1943. Many factors were blamed as contributing to the incidence of the disease, such as high fat diet, climate and unsatisfactory sanitary conditions, but direct association with any of these conditions was never proven. Many authorities believed that Catarrhal Jaundice and Infectious Hepatitis were the same conditions. Treatment was symptomatic in the absence of discovery of any specific etiological factor. The mortality from Infectious Hepatitis was extremely low although the time lost from duty was very high due to the protracted course of the disease and frequency of relapses.
- (4) War Nephritis (Kriegs Nephritis) was quite frequently seen during the war, especially on the Eastern Front. It was considered to be of an acute infectious nature and most closely resembled an acute Glomerulo-Nephritis. Mortality was low but the disease resulted in extensive time lost from duty and many discharges from service due to its chronic nature.
- (5) Typhoid Fever. Although sporadic mild epidemics occurred in Poland and France the incidence of Typhoid Fever was very low. Immunization provided adequate protection for troops except when overwhelming contamination occurred.
- (6) Bacillary Dysentery. In the Polish campaign this was widespread, but the disease was mild clinically. Sulphanomides readily controlled the disease. Improvement in sanitary control resulted in a lower incidence of the disease. The incidence of Gastro-enteritis paralleled the occurrence of Bacillary Dysentery and it was difficult to instruct the field medical officers concerning the criteria for differentiation of the two conditions.

- (7) Scarlet Fever. A considerable increase in the incidence of Scarlet Fever occurred during the war, both in military personnel and civilians. Crowded living conditions with constant travel of large groups of people was believed to be the contributing factor.
- (8) Diphtheria was prevalent in the youth organizations and in the civilian population. A great many civilian deaths occurred in rural regions for lack of antitoxin.
- (9) Pulmonary Tuberculosis occurred less frequently in the Luftwaffe throughout the war than in the civilian population in peace time. This was believed to be due both to the primary selection of only healthy individuals as well as to proper sanitary measures in the billeting, feeding and general care of military personnel. A much higher rate of disease existed in the civilian population, particularly in displaced persons.
- (10) The rate of Syphilis in the Luftwaffe climbed progressively throughout the period of the war. Infection was highest in Italy and Greece, and less high in France. The incidence was extremely low on the Russian front. Efforts were directed towards education of the troops and control of the sources of infection. Severe penalties were imposed on individuals not using prophylactic measures.
- (11) The rate of Gonorrhea similarly increased progressively during the war with the same major areas of high infection as for Syphilis. Sulfate resistant strains of the infection were a problem in Italy due to the indiscriminate sale and use of sulfonamides in that country. Initial treatment of both Syphilis and Gonorrhea were always effected in a hospital. Medical officers apprehended giving duty status treatment were severely punished.
- (12) A high rate of Skin Diseases existed throughout the period of the war, the most prevalent diseases being Scabies and Trichophytoses.
- (13) Influenza and Pneumonia. The incidence of these diseases remained surprisingly low and no epidemic of Influenza, even remotely resembling the severity of World War I Influenza occurred.
- (14) The incidence of Gastric and Duodenal Ulcers were generally agreed to have increased during the war. An interesting point is that the frequency of Gastric Ulcer as compared with Duodenal Ulcer was exactly the reverse to that of normal times. That is, the incidence of Gastric Ulcer greatly exceeded that of Duodenal Ulcer. Such increase in Gastric

Ulcers is believed to be a psychosomatic manifestation of the increased stress accompanying war service.

- (15) No increased incidence of Meningitis, Polio-myelitis, Tetanus, Cholera or Plague amongst military personnel during the period of the war was reported.

c. Immunizations. The following immunizations were required for service in the Luftwaffe:

- (1) Smallpox. Vaccination was performed upon induction and repeated every six years.
- (2) Typhoid, Paratyphoid A & B. Immunization was repeated at six monthly intervals.
- (3) Tetanus. Active immunization was given all members of paratroop organizations. Passive immunization was given as indicated to other members of the Luftwaffe.
- (4) Typhus. Due to limited supply of vaccine, administration was limited to only those Luftwaffe personnel who were most exposed to the disease.
- (5) Dysentery. Immunization was given annually to all troops as directed by the Wehrmacht. Vaccination was not desired by the Surgeon General of the Luftwaffe nor his senior officer in matters of preventive medicine.
- (6) Cholera. At one time Cholera was included in the Typhoid, Paratyphoid vaccinations, but this was later discontinued. With the development of a separate vaccine only those troops on the Eastern front were immunized.

d. Sanitation and Hygiene.

- (1) Each major command was responsible for the sanitation of an area which was exclusively occupied by a particular force. In areas occupied by two or more major forces, a joint commission of services was formed with the senior medical officer of the group as the responsible sanitary control officer. In 1943 after several discrepancies had arisen in the sanitary procedures of the various armed forces, a special department for control of field sanitation was established in the Wehrmacht General Staff. This group considered major policy matters such as area sanitation, and changes in design of standard sanitary equipment.
- (2) The Luftgau Commanders, advised by Luftgau surgeons, controlled Air Force policy of sani-

tation on problems which might arise at station or organization level (26).

e. Dental Service

- (1) Organization. A special Corps of Luftwaffe Dentists was created at the beginning of the war. Policy matters relative to dentistry were decided upon by Oberstabsarzt Fritz Witt, who was on the staff of the Surgeon General. Dental research was carried out under the supervision of Stabsarzt Freitag in the Flugmedizinische Institut of Berlin. A dental officer was on the medical staff of each Luftgau (Sachbearbeiter). This officer administered the activities of dental installations under jurisdiction of the Luftgau as well as rendering service of dental care to personnel of the headquarters. His duties included assignment of dental personnel, review and consolidation of dental records, and approval of requisitions for material such as instruments and equipment. He also supervised the Luftwaffe Lazarett dental department and the numerous dental stations of his command. There were two types of stations, large and small. In all Luftgaus there were a total of fifteen large stations and fifty-five small stations. Besides these fixed installations there were certain mobile units (Sanitäts Bereitschaften) which functioned under the direction of the dentist of the Luftwaffe hospital in the area. In addition, the work of the military dentists was complemented by use of civilian contract dentists in Germany proper.
- (2) Assistants included both specially trained medical department enlisted men and civilians who had had training with dentists in civilian life.
- (3) Dentists serving with troops were charged with the responsibility of instruction in dental hygiene. In the absence of a dental officer in a unit it was the medical officer's responsibility to recognize the need of dental care and to send the individual to the nearest dental station.
- (4) Care authorized. Provisions were made for the treatment of military personnel and their dependents as well as civilian employees. When civilian personnel were treated, the Reich's Health Insurance, an obligatory insurance organization in Germany, reimbursed the Luftwaffe for the expense of the treatment. However, only the cheapest minimum dental care was authorized. Very little gold was used, and this only on approval of

a central Luftwaffe institution. (Luftwaffe Inspection Number 14).

- (5) Hospital dental service. In some Luftwaffe Lazarets there was a section number VII which included facilities for the treatment of maxillo-facial injuries and dental diseases. This section is staffed by either a medical officer or a dental officer. Attached to it was a section for ambulatory patients. The hospital dentist's duties consisted of care of patients and of the hospital staff, and the dental examinations for the examining section (9).

f. Veterinary Service.

- (1) Organization. The Luftwaffe Veterinary Service was headed by a Chief Veterinarian at Luftwaffe headquarters. Each Luftgau headquarters also had a staff veterinarian and veterinary officers were assigned to all of the higher tactical echelons, as well as to personnel installations.
- (2) Food inspection. Basic GAF regulations provided that veterinary officers would conduct the supervisory inspection of all foods of animal origin (these foods are exactly the same as those inspected by USAF Veterinary Service). The inspection included supervision of handling-rooms and of all the equipment and procedures with which foodstuffs were secured, prepared, measured, packed, preserved, transported and issued. A surprise inspection was directed once a month. In addition, the veterinarians supervised the slaughtering and sausage-making activities of the unit; they also conducted courses and lectures on meat, fish and poultry handling, and the preservation and conservation of foodstuffs in their "battle against waste".
- (3) Animals
 - (a) The veterinary and animals service were combined in the German Air Force. Veterinary personnel were not only in charge of the care and treatment of sick and wounded animals, but were also charged with the supervision of care, management and utilization of all the animals belonging to an organization.
 - (b) Animals were used quite extensively by the Luftwaffe. The large number of GAF horses were mostly for vehicular transportation, but they were also used to a great extent in connection with the GAF's farming activities on the more permanent installations. Other farm animals (cattle, sheep, hogs, etc) were also kept on

Luftwaffe farms.

- (c) The GAF also controlled Flak, Signal, Prisoner of War, and other units which had animals of their own.

g. Physical Standards.

- (1) Physical Standard for ground duty services with the Luftwaffe were those established by the Wehrmacht for military service in any of the three major armed forces. These standards are set forth in detail in service regulations (32). This regulation establishes five main physical groupings and tabulates various possible defects and diseases as to acceptability in each grouping. The main physical classifications are as follows:

- (a) Fit for general duty without limitation (A.V. Kriegsverwendungsfähig).
- (b) Fit for general duty under certain conditions (used as supply troops, rear areas, home front, etc.) (Bed. K.V. Bedingtkriegsverwendungsfähig).
- (c) Fit for general labor (home front, headquarters labor, air raid warden) (A.V. Arbeitsverwendungsfähig).
- (d) Individuals temporarily unfit, to be re-examined at a later date (Z.U. Zeitlich untauglich).
- (e) Individuals completely unfit. (U.U. Wehruntauglich).

- (2) The Physical Standard for flying duty were established in the Luftwaffe regulation L.Dv 94. This regulation defines two main physical classes for flying duty. They are:

- (a) Wehrflieger - Military Aviator
- (b) Fliegerschütze - Aerial Gunner.

- (3) Qualification in the first group signifies physical fitness for flying duty as a pilot or navigator. Qualification in the second group permits flying duty as a mechanic-gunner, radio-operator-gunner or career gunner.

- (4) In the early years of the war when it was believed that sufficient numbers of flying candidates might not be available the Luftwaffe General Staff ordered a relaxation of the strict standards of peace time. It was soon found however, that the lowered standards

were unsatisfactory. With the limiting factors of fuel and aircraft production there later existed an excess of trained air crew members and the original more rigid physical standards were resumed.

- (5) Physical examinations for selection for flying training were conducted in the Fliegeruntersuchungsstellen (Flyer examining stations) of which there were approximately seventy, located throughout the various Luftgau. Each station was staffed by two medical officers, usually an internist and an ophthalmologist, and by several enlisted personnel assistants, all of whom had received special training in aviation medicine. Equipment consisted of only the minimum of examining instruments. Each station performed fifteen to twenty examinations daily.

The thoroughness and detail of the physical examination for flying varied widely during the war. In peace time the examination extended through a period of two to three days, utilizing the consultant services of various specialists in completing the examination of each physical system. In war time it was necessary to conduct the complete examination in the examining station; consequently the services of the various consultants were dispensed with, accordingly the format of the examination record was reduced in size, Appendix VI.

- (6) The specific examination performed consisted of a thorough history, general physical examination, examination of special senses, including eye, ear, sense of balance, examination of heart and lungs, Schneider test, test of vital capacity, chest X-ray, blood serology, urinalysis and a concluding personality estimate somewhat comparable to the United States A-F APM. This last was not made by a psychiatrist but by the senior officer of the examining station. Psychological testing of flying candidates which was performed until 1942 was not accomplished at these stations.
- (7) The surgeons of the examining stations generally were allowed certain latitude in selection of applicants and might waive reasonably minor deficiencies if they believed the individual to be a particularly apt candidate.
- (8) Specific values of physical standards were frequently changed during the war. However, approximate values for qualification for flying training and flying duty as a military aviator (Wehrflieger) may be summarized as follows:
- (a) Age 17 to 28 years inclusive.

- (b) Height 160 cm. to 180 cm.
- (c) Weight. No rigid maximum or minimum weight was prescribed and it was within the discretion of the examining medical officer to disqualify the excessively overweight or underweight individual.
- (d) Ocular Standards. In peace time a visual acuity of 5/5 m. in one eye and 5/7 correctible to 5/5 m. in the other was required. During the war this requirement was lowered to acceptance of candidates with 5/15 m. correctable to 5/5 m. in each eye. A spherical correction up to 2.50 D and cylindrical correction up to 1.00 D was permitted. There was no specific standard for muscle balance other than a statement that high degrees of esophoria, exophoria or hyperphoria were disqualifying. The Pulfrich test was used for measuring depth perception. Color vision was tested with Stilling's charts and questionable candidates were retested using a color vision lantern developed by Dr. Ingeborg Schmidt. Night vision was not tested except in selection of individuals for night flying organizations.
- (e) Acuity of hearing was tested by using the whispered voice. Early requirements were that the candidate correctly interpret the whispered voice at four meters with each ear. Later this was reduced to acceptance of individuals with complete deafness in one ear and ability to hear the whispered voice at two meters in the other. Individuals with dry central perforation of the tympanic membrane were not rejected.
- (f) Vestibular standards. No precise standard was ever followed, the examiner merely being required to perform the more simple tests to insure that the sense of equilibrium was roughly within normal limits.
- (g) In the study of the Cardio-Vascular system broad requirements of efficiency were set forth, no fixed limitation of pulse rate or blood pressure values being established. A Schneider test was accomplished early in the war but was deleted from later examination requirements.
- (h) Careful evaluation of the Nervous system was attempted with a general estimate of personality made by the examining medical officer.

- (9) Physical examination records were forwarded to the Central Statistical Archive, Berlin, where an effort was made to keep current a file showing exact physical qualifications of each flying officer.
- (10) Physical standard for flying duty as aerial gunner (Fliegorschutze) were less stringent than those for military aviators. A flyer might serve as a pilot until a certain physical deficiency precluded such assignment when he would not infrequently become a gunner. Visual acuity standards for gunners were 5/30 m. vision correctible to 5/5 m. vision in each eye. No discriminating color perceptions were necessary.
- (11) In general, physical standards for all flying personnel were much less rigid than those of the American Army or Air Force.

h. Care of Flying Personnel.

- (1) Inasmuch as no routine training in aviation medicine existed in the Luftwaffe, most medical officers with flying units had little or no training in the specialized care of flying personnel. It was therefore necessary to establish a form of adjunctive medical service for the purpose of treating, evaluation, and making decisions concerning dispositions and duty status of flying personnel. This was accomplished by the establishment of three distinct types of installations:
 - (a) The Fliegeruntersuchungsstelle. Here the candidate for flying training was given his first examination and the trained flyer received periodic reexaminations.
 - (b) The Sichtungungs Abteilung for screening or examination was a section of an Air Force hospital. This section accomplished the study and examination of flying personnel. The section was staffed by a medical officer usually an internist who had been given specialized training in aviation medicine. He was assisted by one or two company grade medical officers and by several enlisted assistants. More elaborate equipment was provided in such centers than in the Fliegeruntersuchungsstellen. A standard type altitude chamber was included in the equipment.
 - (c) The Sichtungsstelle. In certain situations there existed a Sichtungsstelle operating independently as a small medical unit, usually where there was no Air Force hospital available in an area. Such units were necessarily better staffed and equipped

than the Sichtungs Abteilung, which was an integral part of a hospital. These units frequently had X-ray equipment and small clinical laboratories as well as the usual altitude chamber and examining equipment. Their functions were identical with those of the Sichtungs Abteilung.

- (2) The chief of the Sichtungs Abteilung enjoyed the advantage of working as an integral part of a large hospital where consultations with chiefs of various professional services were constantly available. Thus in his examination of flying personnel he had available the opinion of ophthalmologists, otolaryngologists, psychiatrists and surgeons in the evaluation of flyers as well as in provision of definitive therapy.
- (3) Disposition of an individual was made after such study and treatment as considered necessary. Such disposition usually included one of the following:
 - (a) Return to flying duty,
 - (b) Grounding, temporary or permanent,
 - (c) Hospitalization.
 - (d) Rest leave or treatment in a Kur-lazarett or Erholungsheim.
- (4) On return of a grounded flyer to flying duty, it was usually the practice to have him re-examined at the Sichtungsstelle where his removal from flying was accomplished.
- (5) Decisions of chiefs of examining stations were respected by line commanders as well as by unit surgeons and there existed little or no controversy concerning the disposition recommended. Somewhat more than 50% of cases considered by the station chief were cases under classification of nervous diseases, the majority of these being stress reactions. These cases were treated by temporary withdrawal from flying, either by transfer to a rest home, granting of rest leaves or by reassignment to ground duty. The number of volunteers for flying duty always exceeded the requirement consequently, there was never a need to force the lesser physically fit individuals to fly. Inasmuch as the great majority of air crew members held non-commissioned grades there was no problem in assimilation of rank in their transfer to other duties.

- (6) Records. Certificates concerning medical examinations of the types described above were sent to the following individuals.
 - (a) Medical officer of the organization of assignment of the individual, who in turn informed the commanding officer of the unit.
 - (b) Medical officer who sent the individual to the examining station for study
 - (c) Luftgau medical officer.
 - (d) Certificate Archives of the RIM Blg, 86, Columbia Strasse, Berlin, 3 W 29.
- (7) Each medical officer serving with a flying unit maintained a card concerning the physical fitness of flying personnel under his supervision. Each physical examination accomplished at the various examining stations was recorded on the card.

5. TRAINING OF MEDICAL SERVICE AND AFFILIATED PERSONNEL.

a. Training of Regular German Air Force Medical Officers.

- (1) Early in the establishment of the German Air Force a Medical Training Department was formed. This department was established for the express purpose of controlling the education of all the doctors and other medical personnel required by the Luftwaffe. The trainees were carefully selected and then ordered to Saalow where they were given eight months general military training and elementary studies in hygiene. Upon completing this training they were transferred to the jurisdiction of the Luftwaffe medical school at Berlin, Wittenau (The Aerztliche Akademie der Luftwaffe). Under guidance of the staff of that organization, they completed a full curriculum of medical studies at three university centers: Berlin, Würzburg and Prague. Studies lasted six years in peace time and were reduced to five years in war time. They were never reduced below this period although towards the end of the war many students were ordered to service with line troops prior to their graduation. Terms of study were divided into six month periods. After the fourth term the student sat for a preliminary examination in medicine and after ten terms took the ordinary state medical examination. During recent years special attention was given to training in medical problems of aviation. This training was directed by Prof. Strughold, who was also Director of the Luftwaffe Medizinische Forschungs Institut, Berlin.

- (2) The student doctor successfully completing his state medical examination was given a one year internship in the rank of "Unterarzt" after which he was required to complete a period of field service prior to appointment to officer grade. During the entire period of training the German Air Force provided food, quarters, clothing, pay and allowances but required student cadets to pay their own university fees. A military uniform was worn throughout training.
- (3) In peace time all Luftwaffe medical officers were required to pursue the equivalent of primary flying training after which they were given pilot wings and designated in conversation among military personnel as a "fliegerarzt". This was used in contradistinction to the "Truppenarzt" who might very easily have had more training in aviation medicine but who was not a flyer. The term "Fliegerarzt" however, was never an accepted entity of military nomenclature in the sense of the American use of the term Flight Surgeon.
- (4) Approximately four to five hundred medical students entered training each year but demands of the other services and particularly of the S.S. forced the Surgeon General to release graduates prior to their service with the Luftwaffe. At the conclusion of the war about 800 students were undergoing training.

b. Specialized training of German Air Force Medical

Officers.

- (1) Training in Aviation Medicine. Medical officers whose assignment made them directly responsible for care of flying personnel were given special courses in aviation medicine. Included in this group were doctors working in examining stations (Hohenprüfstellten, Sichtungsstellen, and Fliegeruntersuchungsstellen) aviation medical research institutes, and those serving in the Fliegerkorps with flying organizations.
- (2) The Aviation Medical Training was originally established at the medical research and teaching section (Sanitäts Versuch und Lehr-Abteilung) at Jüterbog under direction of Professor Diringshofen. Other training however, was conducted at Prof. Strughold's laboratory in Berlin and at various other research centers. Instructors employed at the schools were authorities in aviation medicine who came to the schools to give lectures. Instruction for the most part was in high altitude physiology and centered about methods of altitude indoctrination and related subjects. Other instruction was given relative to clothing and equip-

ment, accelerative and decelerative forces, and the use of parachutes. There was little instruction in psychiatry or in other professional specialties. The course of instruction lasted for a period of about two weeks.

- (3) There was never a special, well organized school of aviation medicine comparable to that of the American Army Air Force. In addition to the above studies certain Luftwaffe doctors were called to special meetings at Berlin or at university research centers from time to time (every 3 or 4 months) where programs concerning developments in aviation medicine were presented. Meetings lasted for 2 or 3 days.

c. Other Schools conducted for Luftwaffe Medical Personnel.

- (1) Reserve medical officers of the Luftwaffe had four months basic army medical training upon entering service. They then spent two months at Gattow in Berlin at the Kriegs Schule, studying military, tactical, and sanitation subjects.
- (2) Informal training in specialties was continuously maintained for Luftwaffe medical officers. If an officer had some background in a specialty and desired additional training he might make application to the Surgeon General who would approve his detached service at a University Center. Junior grade medical officers were constantly studying under senior professors of the type of the physiologist Dr. Rein of Göttingen, the pathologist Dr. Buchner at Freiburg, etc.
- (3) Statistics were maintained in the office of the Surgeon General relative to all specialized training of medical officers and attempts were made toward proper and efficient classification and assignment of the officers.

d. Training of Medical Department enlisted men.

- (1) An enlisted man assigned to service with the medical department of the Luftwaffe was always given a course of medical instruction. An enlisted man's medical school (Sanitäts Schule) was conducted in each Luftgau. The course included instruction in anatomy, physiology, pharmacology, first aid, bandaging, and field sanitation. No specialized training as laboratory technician, X-ray technician, or dental technician was conducted since such positions were held by civilian workers.

e. Medical Training of flying personnel

- (1) In peace time about two hours of medical training was given weekly to all students

undergoing any type of flying training. In war time, with contraction of the flying training program, less and less time was allotted to this subject. Instruction for air crews was in altitude physiology, use of oxygen mask and equipment, flying safety and first aid.

f. Altitude Training Program

- (1) The various fixed altitude chambers installed at Air Force hospitals, those at research institutes and the several mobile units were used by the GAF for altitude indoctrination and examination. It was believed that altitude indoctrination was a very important function of aviation medicine.
- (2) Each Examination and Indoctrination unit had one medical officer attached, one or two non commissioned officers and two or three other personnel. Three different types of indoctrinations and examination-runs were performed depending upon the category of the personnel and the stage of their training.
- (3) Examination and Indoctrination Run No.1. This procedure was performed in the early stages of training of all flying personnel. The same run was often repeated in later stages of flying when if possible entire crews were examined and indoctrinated together in order that they could watch each others reactions and thus gain confidence in each others ability. At the beginning of the test a personal mask was carefully fitted. Then the subject was directed to breathe a mixture of 93% nitrogen and 7% oxygen while beginning simultaneously to write numbers backward from one thousand - the so called Lottig test. The record of his handwriting along with clinical notations made on the margin by the medical officer was included as a part of his file. As soon as the subject became anoxic pure air was turned into the breathing system and he was allowed to recover. His student friends or fellow crew members were allowed to watch the procedure as they might understand the symptoms of anoxia. It was believed that the average normal person should be able to undergo the test for a period of at least five minutes before requiring a shift to air.
- (4) Examination and Indoctrination Run No.2. This run was performed on flying personnel who might at some time be required to fly at high altitude. If the subject had not been given Run No.1. within a period of six months that was first repeated. The No. 2 run was an ascent to 10,000 meters then remaining there for a

period of five minutes then ascent to 12,000 meters where various individual reactions and the use of new types of oxygen equipment were demonstrated. The general purpose was to demonstrate spectacularly that a person could live without serious manifestations at 12,000 meters.

- (5) Examination and Indoctrination Run No. 3. This run was introduced early in 1945 and was given to all personnel who might be subject to rapid ascent in jet propelled or rocket aircraft. This run consisted of an ascent to 12,000 meters in 3 to 4 minutes. The subjects would then remain at 12,000 meters for five minutes and then ascend until symptoms of anoxia, decompression sickness or abdominal gas developed. This development usually took place at altitudes of from 13,500 meters to 14,500 meters. When symptoms were severe the subjects were rapidly descended.
- (6) A type 4 Run was under contemplation at the end of the war. This run was being designated to indoctrinate personnel concerning explosive decompression (27).

g. Night Vision Training. The only night vision training employed by the Germans was in connection with their night vision testing program. At the time of the test the efficient use of the eyes at night was explained. No night vision trainers were in use (27).

6. GERMAN AIR FORCE HOSPITALS.

a. General Statement. Prior to 1936, there were no hospitals under the jurisdiction of the Luftwaffe. In the years preceeding 1936 hospitalization for GAF personnel was accomplished in Army hospitals. From 1936 to 1938 a hospital construction program was instituted. After 1938 the Luftwaffe hospitals were considered to be on equal footing with the Army and Navy hospitals. Luftwaffe hospitals were established wherever the troops of the vicinity were predominantly Air Force personnel. This policy was also followed in the activation of Army and Navy hospitals. In view of this policy, personnel of the Wehrmacht needing hospitalization were hospitalized in the nearest military hospital regardless of whether it was GAF, Army or Navy. According to available information there was a spirit of mutual cooperation (although at times competitive) among the hospitals of the three services. By agreement specialized sections of hospitals (i.e. section of Neuro-surgery etc.) would not be reduplicated in a Luftwaffe Hospital if that specialized section existed in a nearby Army or Navy hospital.

b. Hospital Planning.

- (1) With reference to the planning of the number of hospitals and hospital beds needed, there

has existed for the past hundred years in the German Wehrmacht definite plans relative to the number required. In the year 1850, the number required was based on 6% of the strength of the command. During the present war the number required was considered to be 4% of the strength of the command. However, experience of the Luftwaffe during the present war disclosed that the figure of 4% of the strength of command was too high and consequently, this figure was reduced to 2 to 2½%.

- (2) The general policy was that construction of the hospitals in the Zone of Interior (Germany proper) was to be on a permanent basis. These hospitals were to be supplemented by the use of large buildings in the various Spa areas when required. As Germany expanded, additional hospitals were established in the Zones of Communication usually by taking over hospitals or suitable buildings in the newly acquired territories. When necessary, semi-permanent or temporary types of hospitals similar to our cantonment type of hospital were constructed. As a last resort field hospitals were established in tents.
- (3) According to information received from the Surgeon General of the GAF the budget allowed for constructions and current expenses of hospitals was sometimes inadequate. An example of the funds authorized was given for the year 1943 when ten million marks were allotted for new construction and seven million marks for current expenses.

c. Hospital Construction. In the establishment of the GAF Hospital System high ranking German medical officers had definite ideas concerning construction. Consequently all hospitals were built in accordance with certain principles of design. These principles were that hospitals should have the form of a "T" with the long leg of the "T" pointing north and containing administrative offices, treatment and consulting rooms, while the top of the "T" should face south and constitute the main portion of the hospital proper, containing all the wards. Southern exposure in Germany afforded better protection and in addition gave the patients a maximum of sunlight. The Surgeon General of the GAF was asked to prepare a paper on the construction of Military Hospitals. It is attached as Appendix VII.

d. Internal Organization of GAF Hospitals.

- (1) Luftwaffe hospitals were divided into seven to nine Abteilungen or sections. An example is shown below in the list of divisions of the Luftwaffenlazarett of Halle-Döhren, a 565 bed hospital.

Section I Internal Diseases (Medicine)	160 beds
Section II Surgery	190 beds

Section III	Skin and Venereal Diseases	55 beds
Section IV	Ophthalmology	40 beds
Section V	Otolaryngology	30 - 40 beds
Section VI	Neuropsychiatry	30 beds
Section VII	X-Ray, Dentistry etc.	- -
Section VIII	Aviation Medicine	40 - 80 beds.

- (2) Each of the above sections had a chief with such assistants as were required. The basic requirement for the dental service of each hospital was one dental officer and two assistants. The basic requirements for administration (not including the Commanding Officer who was always a Medical Officer) were as follows: An Executive Officer or Adjutant; a Mess Officer; a Finance Officer; and a Supply Officer. In addition there was a Pharmacy Officer who had dual responsibility of operating the pharmacy and taking care of all medical supplies. Any non-medical supplies such as chairs, paper, typewriters, desks and tables were requisitioned by the supply officer.
- (3) Each Luftwaffe Hospital as noted above has a special Aviation Medical section (Sichtungsabteilung) wherein all flying personnel with any problem related to flying were placed. The chief of this section was always a medical officer well trained in aviation medicine. If the individual hospitalized presented any particular problem related to a special field such as for instance an eye condition or a neurological condition, he was referred in consultation to the head or chief of that section. Practically all Luftwaffe hospitals had low pressure chambers installed for use by the section of Aviation Medicine.
- (4) Attached as Appendix VIII is shown an abbreviated Table of Organization Chart of a typical 500 bed GAF Hospital.

e. Specialized Hospitals. (Sonder Lazarett) The Luftwaffe did not operate specialized hospitals although in many instances special sections of certain GAF hospitals were enlarged for the treatment of specific types of cases. An example of this is the section of Neuro-surgery, headed by Prof. Tönnis, at the Luftwaffe Lazarett, Berlin. The Army, on the other hand, did have hospitals which specialized in such conditions as orthopedic surgery and plastic surgery. It was pointed out that during the Russian Campaign certain ground force field hospitals were organized primarily to take care of typhus fever cases.

f. Convalescent Hospitals (Kurlazarett) Two types of convalescent hospitals were operated by the Medical service of the GAF. One type was that which admitted patients needing further medical care. The other type was for those requiring no additional

medical care but mainly exercise, good food and fresh air for complete rehabilitation. The latter type at times were operated as Rest Homes and were not under medical control. However, during the last year of the War there was a movement to place this type of unit under complete medical control.

7. AIR EVACUATION.

a. General. Air evacuation in the Luftwaffe was well organized and extensively used on all fronts. During the period 1939 to 1945 over two million wounded and sick were evacuated by air. General Handlöser, surgeon of the Wehrmacht, and former surgeon of the Army was generous with praise for the assistance provided by the Luftwaffe in evacuating casualties. He felt, he stated, that during the last period of the war when ground transportation channels were disrupted a chaotic situation in the evacuation and care of the wounded would have developed had not the service of air evacuation been available.

b. Organization. Air evacuation units were set up as special medical commands, the Sanitäts Flugbereitschaft. One or more of such units were assigned to each Luftflotte although the policy concerning their utilization remained a function of the Surgeon General of the GAF. At the period of maximum expansion there were eleven such units in the Luftwaffe. Each Flugbereitschaft was commanded by a medical officer who had command jurisdiction over flying and line personnel as well as medical troops.

c. Equipment. Each unit was equipped with six Junker 52's and four Storch 156's as well as ten ambulances. Performance specifications of the aircraft were as follows:

	km/ph	Flight time	Runway required	Capacity for patients.
Sanitäts Ju 52	200	4½ hrs	500-600 m	12 litter & 6 ambulatory or 24 ambulatory.
Sanitäts Storch 156	140	4½ hrs	100 m	2 litter or 2 ambulatory.

Reports state that the Junkers 52 was a transport aircraft especially adapted for air evacuation. Work in modification and equipment of fittings had been performed at the Sanitäts Versuch und Lehr Abteilung at Jüterbog. The Storch 156 was a single engine low horsepower aircraft similar to the USAAF L.5. The normal transport and troop carrying aircraft employed for tactical purposes were available when occasion demanded. These aircraft had special fittings which they carried at all times. ME 323's were occasionally used in evacuation although no special fittings were provided in this aircraft. Sanitäts aircraft were at all times unarmed. They were originally painted white with a large red cross but according to an informant, subsequent to unfortunate experience when aircraft were destroyed both in the air and on the ground, a dull greyish blue camouflage paint was used. Oxygen equipment was not standard in aircraft ambulances since operation was usually at low altitudes. One unit operating between Germany and

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Italy was equipped with oxygen fittings since evacuation required flying at altitude while crossing the Alps. Special heating systems were installed in the JU 52's and were considered to be of importance in the care of the patients.

d. Operations. The Flugbereitschaft were used in evacuating all types of troops but army personnel comprised by far the majority of patients carried. The Surgeon of the Luftflotte to which the unit was assigned exerted direct control of the tactical use of the unit. A system of communication with headquarters of the unit, kept the commanding officer informed of numbers of aircraft needed in specific areas for evacuation. All types of casualties were accepted for evacuation but preference was given to those cases which would benefit most by return to treatment centers in the Zone of Interior. Very few deaths occurred in flight since only those cases were selected who were considered in good enough physical condition to be moved. In flight each aircraft had one medical department enlisted man as attendant for the patients. No administration of blood or fluids in the form of intravenous injections was attempted. Neither medical officers nor female nurses flew regularly as crew members. Air evacuation was further employed in the removal of patients from hospitals being closed as a result of a retreat of the Army. Attacks by enemy aircraft and weather were the two factors making operation most difficult. Toward the end of the war, the entire area of Germany was so closely patrolled by allied fighter aircraft that flight of air ambulances were not attempted except at early dawn or at twilight, with occasional flights at night. Flights were always made at two to three hundred meters of altitude to avoid detection. Storch aircraft were used in short hauls between advanced areas and Corps or Regional Command Stations where patients were transhipped into Junkers 52's and flown to the Zone of Interior.

8. MEDICAL REPORTS.

a. General. The medical reporting system of the German Air Force was very similar to the reporting system of the American Army. Unit Surgeons and Commanding Officers of Luftwaffe Hospitals were responsible for the rendition of the reports. Medical reports from hospitals were rendered through medical channels to the Luftgau Surgeon where they were consolidated and forwarded to higher headquarters. Medical reports from Unit Surgeons were forwarded through command channels to the Luftgau headquarters where they were consolidated by the Luftgau Surgeon and forwarded to higher headquarters. All medical reports finally reached the office of the Surgeon General of the GAF where they were analyzed and statistical studies accomplished by the statistical division (medical reports) of that office.

b. The Surgeon General of the GAF made the statement that it was his desire to keep reports to a minimum and make them as simple as possible. He further stated that as far as medical reports of the Luftwaffe were concerned there was one basic report. This report was rendered monthly by medical officers of tactical units, and by commanding officers of hospitals. This basic monthly report when rendered by a unit medical officer was called the Unit Sick Report (Truppenkrankennachweis)

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and when rendered by a hospital was called Hospital Sick Report (Lazarettkrankennachweis). The reports were quite similar. During the early part of the war they were rendered every ten days. A copy of the Unit Sick Report is attached as Appendix IX.

c. Specific Medical Reports. The unit Sick Book was kept by all units and from it data were available for the formulation of the Unit Sick Report. Likewise in a hospital a Sick Book was maintained the data forming the source of the hospital Sick Report. Other reports were as follows:

- (1) Flying Accident Reports. These were rendered as special reports after flying accidents had been investigated. The medical aspect of these accident reports were reviewed for the Surgeon General by Dr. Ruff, Director of the Deutsche Versuchsanstalt für Luftfahrt, Berlin-Adlershof.
- (2) Quarterly Report of Flying Personnel. This report was similar to the Care of Flyer Report in the AAF. It contained essentially the following information:
 - (a) Information on Casualties (including wounded and missing).
 - (b) Certain activities of the Unit. This section contained information relative to quarters and billeting, medical officer's observations during combat and special observations and certain information relative to flying accidents. It was rendered in narrative form which allowed the unit medical officers considerable latitude in its preparation.
- (3) With reference to Air Evacuation Reports the following is quoted from AI-12/USSTAF/Y.21 B: (4)

"A. Air Transport Report

- 1) Duty ambulance flights (Sanitätsflugbereitschaften) keep no hospital sick books and prepare no hospital sick reports.
- 2) For the transportation of wounded or sick by air, an Air Transport Report must be rendered.
The Report is prepared by:
 - a) the leader of the duty ambulance flight when the transportation is directed through him, when his aircraft is used, or when an aircraft is set at his disposal for such cases,
 - b) the medical authority of the unit in individual cases not handled by the duty ambulance flight,

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- c) the medical officer of the airfield to which the patient is brought if he is transported outside the jurisdiction of the duty ambulance flight.
- 3) The air transport report is made out in duplicate. The original copies are sent collectively on the first of every month by the duty ambulance flight through the usual channels to the Director of GAF Medical Services. The same reports prepared by the other authorities (b and c above) are also sent on the same day to the competent medical officer of the area, who directs them to the Director of GAF Medical Services. All second copies are sent to the Central Archive for Medical Matters of the Armed Forces (Army and GAF) on the first of April and first of October of every year or when the organization is disbanded". (A copy of the Air Transport Report is attached as Appendix X.)
- "4) In addition to the monthly air transport report, the duty ambulance flight must send the following:
 - a) A report of experiences concerning important findings.
 - b) A weather report covering the area of flight at the average altitude. (Altigraphs are issued to each duty ambulance flight, although their use will generally be limited to flights over 2000 meters.)

B. Transport Report

After a medical transport unit has been employed, it reports to its competent superior medical officer concerning the length of activity, approximate number and place of stay of the wounded, and the number and nature of operations performed. If the unit is employed over a longer period of time, this report is made daily". Appendix XI.

- (4) In spite of the statement by the Surgeon General of the GAF to the effect that only one basic medical report was required, the German Luftwaffe Medical Service required many other medical reports of subsidiary nature. A portion of the required GAF medical reports are listed, the titles being self explanatory:

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- (a) Semi Annual reports of high ranking medical officers (example: reports rendered by Luftgauerzt and Luftflottearzt).
- (b) Semi annual reports of consultants.
- (c) Monthly Personnel Reports.
- (d) Reports of special communicable diseases.
- (e) Monthly Venereal Report.

1) The monthly Venereal Report was initiated by the unit surgeon and forwarded to the commanding officer who in turn transmitted the report through command channels. Control of Venereal Disease according to the Surgeon General of the GAF was a command function and responsibility.

- (5) For complete data relative to the GAF Medical reports, the reader is referred to D (Luft) 2301 (Arztliches Bericht und Meldewesen der Luftwaffe im Kriege) (8).

9. FLYING SAFETY.

a. Investigation and coordination of the medical problems of flying safety were conducted at the Flugmedizinische Institut, Adlershof, Berlin under the direction of Dr. Siegfried Ruff. Dr. Ruff's institute was directly under the supervision of the D.V.L. (Deutsche Versuchsanstalt für Luftfahrt) and was a civilian organization. The research conducted was not only for the Luftwaffe, but also for civil and naval aviation. Direct liaison was maintained by Dr. Ruff with the Safety and Equipment Division of the Luftwaffe General Staff, the Surgeon General of the Luftwaffe, and the various research institutes performing work for the airforce as well as with the many technical divisions working under the D.V.L.

b. In changes in aeronautical design and in development of new designs, full specification and reports were forwarded to the Flugmedizinische Institut for criticism and comment on the medical and physiological consideration of the new design.

c. The aircraft accident investigation department of the Flugmedizinische Institut made a careful study of each aircraft accident report and maintained statistics in order that they might recognise difficulties either in aircraft design, equipment or in training of crew members proving to be frequent factors in aviation accidents.

- (1) Statistics concerning aircraft accidents, although kept by the institute, were not published since it was believed that publication of such figures would have an adverse effect on the morale of flying personnel and of the public and be of value to the allied powers.

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(2) A card file system of the accidents of each pilot was maintained in peace time at the institute. Entries were made concerning each aviation accident. In the event a record showed repeated accidents the individual was ordered to an examining station for a complete physical examination. In war time it was difficult to maintain individual records in the central institute consequently the responsibility of study of individual records was delegated to the unit surgeons.

d. The standard aircraft accident reports (Arztliche Flugunfallmeldung) Appendix XII were kept in file in the institute. This report was accomplished by the unit medical officer subsequent to each accident. One copy was forwarded to Dr. Ruff, one copy to the Luftgau Surgeon, and one to the Luftflotte Surgeon.

e. Aviation accidents were classified into:

- (1) Technical failures.
- (2) Personnel failures (aircrew or ground crew)..

f. Frequency of types of accidents was given in the following order:

- (1) Landing and take-off accidents resulting from personnel or material failure.
- (2) Accidents in flying resulting from blackout or disorientation of pilot.
- (3) Accidents resulting from blinding by sun glare.
- (4) Accidents resulting from oxygen failure.

g. Correlation of Physical Standards with flying safety received careful attention. A close study was made of physical standard requirements and if the Luftwaffe General Staff lowered a requirement below that which was considered to be a safe level, objection was made to the appropriate authority. However, many trained individuals were permitted to fly despite serious physical defects. It was estimated that approximately one hundred and fifty pilots with a major amputation were permitted to fly as were perhaps six or seven pilots who had lost the sight of one eye. All such individuals were given a strict performance test at the Medical Research and Training Center at Jüterbog, prior to being permitted to return to flying duty. Dr. Ruff did not believe that trained personnel with an amputation or with loss of sight in one eye were any more prone to accidents than individuals having their full faculties. He based this assumption on his belief that a highly trained, highly motivated individual with many years of flying experience, is better equipped to handle an aircraft and make the proper responses in an emergent situation than an individual with less flying experience and motivation, but possessing his full faculties.

h. Flying Safety Training. Forty hours of flying safety instruction were given to students during their period of flying training. Subject matter included use of oxygen equipment, parachute training (without jumping), training in escape from aircraft, positions to be taken in aircraft to avoid injury, maintenance of physical fitness as well as the use of each item of standard equipment such as safety belts and harness. Publications concerning flying safety for the information of all flying personnel were issued regularly by the Educational Division of the General Staff.

i. Personnel of the Flugmedizinische Institut were continuously engaged in research concerned with improvement of flying safety. Research included investigation of seat belts and shoulder harness, ejection seats, standardization of instruments, deceleration studies, parachutes, flying clothing and such other subject matter as might be ordered by the D.V.L.

10. AVIATION PSYCHOLOGY PROGRAM.

a. Introduction. The following sub-section is based upon information secured from interviews with seventeen German psychologists, twelve of whom had served as GAF or Army psychologists, and from the examination of various documents. The interviews were conducted in the offices or homes of the informants. Chief emphasis is given to the use of tests and other psychological techniques for the selection and classification of GAF personnel. This work of psychologists was not done in the Medical Department, as it is in the AAF. However, since the Aviation Psychology Program of the AAF is the responsibility of the Air Surgeon, inclusion of this sub-section in the present report is justified.

b. Development of Psychology in the German Armed Forces. After a brief beginning in World War I, psychological work in the present German Army was renewed in 1920 with the publication by the German War Ministry of a directive on "Psychology in the Army" (30). A center for direction of psychological research was established during the same year at the University of Berlin, with Prof. Dr. J.B. Rieffert as its head. In May, 1922 there was formed a "Psychotechnical Laboratory of the German War Ministry" in Berlin. Later, in 1925, Dr. Rieffert, Dr. Lersch and Dr. Rudert were appointed to a "Commission for Questions of Army Psychotechnique". This committee planned procedures for selecting officers, non-commissioned officers, and technicians. In 1925 there was also established at Stuttgart, under direction of Dr. Ehmke, the first psychological examining center. The work during this period was on an experimental basis. Finally, on 1 April, 1927, the German War Ministry directed that all officer aspirants be given a psychological examination. The Navy, which had been developing a psychological program under Dr. Mierke, followed with a similar requirement in 1928.

c. Development of Aviation Psychology. As the German Air Force grew, special tests were devised to select men for pilot and other aircrew positions. By 1936 a number of these aircrew tests were in routine use, but all testing for the Air Force was done by the Army. As the Luftwaffe became more independent, so did the psychological testing program, until by 1939 an entirely independent program had been established. Dr. Paul Metz was made



of training; for Fliegertruppe, whether pilot, observer, bombardier, gunner or technician; for Flaktruppe, whether height finder or sound operator. There was one such testing center in each of the nine Luftgaus or air districts in greater Germany.

- (3) Regimental Psychologists. Soon after the beginning of the war psychologists were assigned to the four types of basic training regiments (Air Force, Flak, Communications and Paratroop). Final classification of personnel was accomplished in these regiments rather than at the recruiting centers. Men who had been drafted were tested for the first time, and in many cases volunteers who had been examined at an earlier date were re-tested. Examinations also were given to some of the men who had seen active service and been recommended by field commanders for officer training. In some cases the latter men were examined at officer candidate schools.

e. Personnel. Officers for the psychological units were selected carefully in the early days of the program but after the beginning of the war professional standards were greatly lowered. Initially the Ph.D degree and a year of training as an assistant at a psychological unit was required. Later men with training in fields such as education, philosophy and even theology were given a short period of training and assigned to conduct psychological examinations. No exact figures on the number of psychologists assigned to the GAF were obtained. Estimates were that about 150 psychologists were employed in the last stage of the program. There were about 8 to 10 psychologists in Berlin; 1 or 2 in each Luftgau headquarters; 4 to 8 in each Luftgau recruiting center; a total of from 5 to 8 in the training regiments of each Luftgau; and from 4 to 5 in each Recruiting Center for Officers. Almost all psychologists were Wehrmacht Beamte (officials) with a status which resembled in many ways that once planned for the Army Specialists Corps in the American Army. Some enlisted men and some civilians were used as assistants.

f. Relation to Other Branches. Although the close relationship of psychological and physical selection of aircrew personnel has been recognised by both the American Army and Navy Air Forces, the two programs were entirely separate in Germany. At the officer recruiting centers one medical officer and two army officers together with several psychologists formed a commission which made recommendations to the Director of the Center, who in turn made all final decisions. At the Luftgau recruiting centers the medical and psychological sections were often housed in the same building and often worked closely together. On the whole, however, there was much duplication of efforts, lack of cooperation and lack of understanding between the psychological and medical selection programs. The relation of the psychological program to other branches of the GAF also was not sound. In the status of Wehrmacht Beamte, psychologists had no command responsibility. The final decision regarding selection and classification was always made by a regular Air Force officer. Examining centers worked without knowledge of quotas and exact training needs and without final responsibility for classification.

g. Tests. No uniform test battery for all candidates, such as is used by the A.F., was employed. The tests varied with the testing center, the type of candidate examined, and with the individual psychologists in a center. A few tests were mandatory, others were used more or less regularly. The following list includes the most important tests available for use. This entire list was never given to any one man. The names of the tests are not always literal translations of the German name, but are descriptive of the nature of the test. The grouping of tests under six main headings is that of the writer. A description of each of these tests is given in Appendix XIII.

- (1) Tests of Intelligence, Judgment and Proficiency.
 Writing an essay.
 Verbal memory.
 Mental arithmetic.
 Arithmetic problems.
 Judgment.
 Mechanical comprehension - moving picture test.
 Mechanical comprehension - interpreting drawings.
 Mechanical assembly.
- (2) Tests of Perceptual Ability.
 General observation - moving picture test.
 Distance perception - horopter scope
 Distance perception - Herring's falling marbles test.
 Exner's spirale - after image test.
 Aubert's test (Korrekturbrille) - curved space problem.
 Orientation test - memory for absolute and relative directions.
 Revolving chair - ability to use visual and auditory cues in conflict with sensations of movement.
- (3) Tests of Coordination and Reaction Ability.
 Coordination test - manipulation of stick and rudder in response to a pattern of lights.
 Complex reaction test - reaction with hands and feet to visual and auditory signals.
 Vertical wheel - reaction while in a rotating wheel.
 Balancing on an unstable platform.
 Battery of sports tests - running, jumping, obstacle course, chin up, shot put.
- (4) Tests of Personality, Character and Leadership Ability.
 Personal questionnaire.
 Analysis of handwriting.
 Analysis of speech and voice.
 Analysis of facial expression - motion pictures.
 Group discussion - ability to lead a discussion.
 Orders test - ability to direct a group of men on a practical problem.
 Obstacle course - study of behaviour as the candidate neared physical exhaustion.

(5) Tests of Special Aptitudes.

Code recognition test - phonograph records.
Code reproduction test - reproducing code sounds.

(6) Exploration (Final interview).

h. Principles of Psychological Testing as practiced by military psychologists in Germany, were completely at variance with principles observed in the American Army. Whereas American methods are standardized, objective and quantitative, the methods in Germany were clinical, subjective and non-quantitative (17). The German point of view was that clinical observations of the candidate's behaviour while taking a test were more important than the actual test scores. This attitude is illustrated by the statement of a man who was formerly assigned to a Luftgau headquarters with responsibility for training and supervising new psychologists. He reported that the chief fault of the new examiners was that they paid too much attention to objective test scores and not enough attention to the candidate's reactions and expressions. Individual units and individual psychologists were permitted to emphasize the testing procedures which they liked best. One man, for example, who had written his dissertation for the doctorate on "The First Impression", said that in examining candidates he found that he was always right if he followed his own first impression. Another examiner said he had specialized in the study of graphology and relied chiefly on handwriting analysis. The leaders of German military psychology were men of theoretical training and were not outstanding experimental or applied psychologists. Few of them knew even the simple rudiments of statistical or research methods. To understand this failure to use exact scientific test methods requires also a reference to the social and political philosophy which developed in Germany after the first World War. Popular opinion was strongly opposed to "psychotechnics". It was proposed that qualities of the German mind could not be studied scientifically. Educators and other leaders supported this romantic point of view and many of them strongly opposed scientific study or analysis of individual abilities. The idea was fostered that the important thing was not aptitude or ability, but qualities of personality, belief in German ideals and loyalty to party and authority.

i. Test Administration Procedures, were supervised by central offices in the Luftgau headquarters and in Berlin. Each candidate was given an opportunity to state his preference for a special type of training before testing was begun and procedures were governed in part by the desires of the man for different types of assignments. The length of testing varied from 1 to 3 days depending upon the specialty, the testing load, and the stage of the war. More time was given to testing officers, pilots and navigators than to other specialties. The intelligence and proficiency tests, and group tests common to all specialties, were usually given on the first day. The sports tests were also frequently given the first day. Aptitude tests for particular specialties, such as tests of perceptual or coordination ability, were usually given later. The complete batteries for testing aircrew volunteers and which were in use at the Luftgau Recruiting Center in Hamburg in 1940, are given in appendix XIV. At the end of the first day the results of the testing were assembled and ten to twenty per cent of the poorest candidates were either

eliminated or told that they must try for a lower specialty. For the individual tests each candidate was assigned to one examiner. At first each psychologist examined only one or two men a day, and group conference of all psychologists at a center were held on each man. Later in the war as many as 10 to 15 men were tested each day by each examiner, and he alone made the final decision regarding each of these candidates.

j. Final recommendations were based upon the clinical judgement of the examiner and not upon any standardized procedure for weighting and combining test scores. There was general agreement, but no published directive, concerning the special abilities desired for the various specialties. Extreme personality types were considered unsatisfactory. Effort and motivation were thought to be more important than achievement. In the selection of pilots emphasis was placed on alertness, quick reactions, intelligence, orientation ability, motivation and coordination. Observers were selected for good intellectual ability, plus orientation and mathematical aptitude. Standards for bombardiers were lower than for pilots and observers and no specific aptitudes were looked for. Gunners were selected for strength, practical ability, normal reaction time and normal coordination. Men were given four ratings for the specialty in which they were applying; (1) Fully qualified; (2) Qualified; (3) Minimally qualified, or (4) Not qualified. A summary, about a half page in length and containing the most important findings of the examination, was prepared for each man. Copies of two such reports are attached as Appendix XV.

k. Research in Psychology. The research program in psychology was centered in the Central Psychological Laboratory in Berlin, and local units were not permitted to engage in research. The records of the Central Laboratory have not been examined, but the assistant Director was interviewed, (the Director was killed while on active duty as a pilot during the latter part of the war). All informants stated that research publications were not issued by the laboratory. It was reported that occasional follow-up studies of the validities of individual tests and of the recommendations regarding training were made. Reports of such studies have not been located. No systematic procedure existed for routinely securing criterion data on success in training or in combat for all men.

- (1) Validation. Several of the informants reported that at annual meetings of Wehrmacht psychologists in Berlin, reports were made concerning the success of the program during the proceeding year. At various times it was reported that between 75 and 90 per cent agreement had been found between examination findings and later success in the GAF. No explanation could be given of how these percentage figures were obtained. One informant referred to a short research report seen in 1937, which he remembered as stating that 95 per cent of men rated as fully qualified or qualified on the basis of the examination were successful, whereas only 50 per cent of men rated minimally qualified or not qualified, were successful. He did not recall the number of cases or the criterion of success. The official monthly classified publication of the Army Psychologists, "Wehrpsychologische Mitteilungen", has been examined. It contains no validation

reports on Air Force personnel. Two issues in 1939, devoted to the Air Force program, contain only articles describing the organization and the tests used. Some validity studies on Officer selection are reported but the criteria used are judged to be entirely inadequate.

- (2) Test Development was based upon job analysis and on theoretical considerations. The selection tests for officers were the same as those used by the Army. These tests and examination procedures changed very little after 1928, when, according to one of the three men responsible for starting the program, it was felt that procedures were "satisfactory". The special tests for aircrew personnel were developed before 1939 and during the war only minor changes were introduced, such as those made to accommodate more candidates, or such as the use of different mathematical problems or different passages for the memory test, or elimination of the use of motion pictures of facial expression due to shortage of film. After 1942 no agency in the GAF was responsible for, or undertook to develop selection tests, except for the work on remote controlled bomb operators described below.
- (3) Research on Training Problems was contemplated in the original plans for psychological work in the Air Force. It was proposed to place psychologists in all of the specialized training schools. However, this was never done, and as far as could be determined no research on training methods, training devices, or on the measurement of proficiency was undertaken.
- (4) Problems of Utilization of Personnel, after original classification, were not a concern of the psychological program. In the selection of pilots for special duty, such as jet plane pilots, night fighter pilots or instructors, no use was made of aptitude or proficiency tests and as far as is known no research on these problems was undertaken.
- (5) Development of Selection Tests for Remote Controlled Bomb Operators was undertaken by the Medical Research Institute at Garmisch-Partenkirchen. Three tests were used; a simple coordination test; a visual acuity test; and a test of ability to discriminate "minimal movements". The training records of one hundred men selected with these tests were examined by the Institute, but no quantitative validity study of the data was made. It was reported that the "minimal movements" test was the best of the three.
- (6) Research on Fatigue and Efficiency, utilizing psychological tests in an effort to measure decrement in performance, was carried on in

several laboratories in Germany. This work was not connected with military psychology, but is included in this section because of relevance toAAF problems.

- (a) At the Psychological Laboratory of the University of Göttingen a technique was developed by Dr. Dückler for measuring fatigue by means of difficult mental, arithmetic problems. The subject was seated before a screen on which problems similar to the following were projected:

$$9 + 8 - 5 =$$

$$6 - 2 + 3 =$$

His task was to compute the answers to the first line, remember this number while computing the second line, then add or subtract the two resultant numbers depending on which was larger and call out the result. Problems were presented automatically. The number of problems completed and the number of errors made were recorded by the examiner. Individual differences in ability to perform this task were great. The technique was employed with well trained subjects to study the effects of various stimulants. It was reported that doses of pervitin produced from 20 to 40 per cent increase in performance, lasting up to 24 hours, with no period of decreased efficiency afterwards.

- (b) The Medical Research Institute at Garmisch-Partenkirchen used eight short tests (breath holding, chin-up, strength test, simple reaction time, simple coordination, tracking tests, cancellation test, numerical operations) which required 25 minutes to administer, in studies of fatigue. This battery was administered to a very small group of men eight times a day for a month and then the effects of various drugs on test performance were studied. All results were reported to be negative. Next the effects of drugs on performance in sports such as skiing were studied by securing subjective reports and by observing and taking movies of the men in action. The latter method, although more subjective, was reported to have revealed definite effects from several drugs.

- (c) At the Psychological Laboratory of the Technical High School at Danzig a technique was developed by Dr. Ehrenstein for measuring fatigue by the use of optical illusions (16). In a study of 80 shipyard workers, tested at the beginning and at the end of a 9 hour day of exhausting physical work, it was found that the illusions were considerably greater at the end of the day. The original data have been examined and

the difference found to be significant at the 1 per cent level. This technique is of special interest because the test itself is not fatiguing and requires only a few minutes to administer.

- (7) Development of New Clinical Tests in Germany has been limited chiefly to projective techniques. One of these tests requires the completion of drawings. It consists of a sheet divided into eight $1\frac{1}{2}$ inch squares, each containing a few straight or curved lines. The candidate is told that these lines are part of a picture which he is to complete. An elaborate scoring method is used. In another test, called the "Impressions Test", six figures resembling in some ways the Rorschach plates, are presented by means of slides. These figures are more varied than are the Rorschach cards, and several are partially structured. The administration and scoring is somewhat simplified but resembles the Rorschach method. Both of these tests were used at the German Institute for Psychological Research and Psychotherapy in Berlin, at hospitals for brain injury cases, and at various clinics.
- (8) The Design of Sights and Controls was studied by the Medical Research Institute, Garmisch-Partenkirchen in an effort to provide data for adapting such equipment to the capacities of the operator. This work was done by medical officers, mathematicians, physicists and a psychologist. Comparisons were made between various reticle designs, and between various types of control devices. On the basis of very small numbers of cases and without statistical treatment of the data it was concluded that controls operated by the feet were many times less accurate than hand controls; that movements utilizing hands, arms and shoulders were more precise than movements utilizing only the hands and fingers; and that a single control moving in several dimensions was superior to several controls each of which moved in only one dimension.

1. Evaluation. A basis for the evaluation of the German Air Force psychological program could be a comparison of its success in the selection of good officers and effective specialists with the success of the RAF program. However, in the absence of any data concerning the validity of the tests and procedures used by the Germans, such a comparison is not possible. To evaluate German Psychological testing methods by making comparisons between quality of German personnel admitted during and after the existence of a psychological selection program is not a legitimate procedure, because of the many changes in conditions within Germany after 1942.

It remains, then, to summarize observations regarding the practical or military aspects of the program, and to review critically the soundness of the techniques and procedures used, as judged by American standards.

(1) Practical and Military Effectiveness of German aviation psychology was limited, as indicated by the fact that it was discontinued before the end of the war. Evidence indicates that the elaborate clinical testing procedures were impractical. Other reasons indicate that psychology, as a liberal science of the individual, was never fully accepted by the Nazi party or by the German military caste. The reasons for discontinuing the program are listed below.

- (a) Selection and classification on the basis of individual aptitude was opposed by many German officers. In numerous Prussian families it was mandatory that at least one son become an Army officer. It was traditional for the commanding officers of Army units to perpetuate their own caste by nominating officer candidates from these families, and the officers were jealous of any program which interfered with this system.
- (b) The Nazi party placed great importance upon party affiliation, and on membership in one of the youth organizations. It was directed that men who had belonged to the Flying Corps or the Motor Corps be given preference by the G.A.F. The party considered it more important that men with this background be selected as officers and aircrew members in order to increase the control of the party over the Army, than that men be selected whom the psychological examination showed to have the most aptitude. For this reason the party never supported the psychological program.
- (c) The examination procedures developed for the peace time Army were not suitable for war conditions. There were not sufficient trained psychologists to continue the elaborate testing procedures. With the use of untrained examiners and with heavy testing loads the testing procedures, which were always subjective and unstandardized, became increasingly unreliable.
- (d) Military organization of the psychological program was poor, especially the relationship with the medical department. Testing

was carried out by a semi-military group without any authority for disqualifying candidates or for actual classification, without direct contact with practical problems of training and of utilizing personnel and without coordination with the medical selection and research program.

- (2) Scientific Evaluation of testing procedures can be made by reference to recognized American standards. Judged by these standards German methods are inferior. Specifically, the following criticisms can be made.
 - (a) Procedures were subjective and depended on the skill of the individual examiner. There was little recognition of the problem of reliability. Procedures were unstandardized and there was little uniformity in testing different candidates.
 - (b) The program was static. In the absence of an effective research program or plan for constantly refining procedures on the basis of accumulated data, few advances were made in testing procedures over a period of almost twenty years.
- (3) The greatest advantage of the German method was its comprehensiveness and thoroughness. A systematic effort was made to observe a great variety of individual aptitudes and abilities. Some of the testing procedures deserve systematic try out and validation with GAF personnel, and should be of value in so far as they furnish ideas for future research. A few recent projects concerned with important problems such as the measurement of fatigue and efficiency, and the design of equipment for more efficient operation, reveal a more quantitative approach, but have not yet produced conclusive findings.

11. NEUROPSYCHIATRY.

a. Organization. In January 1941 a psychiatric consultant to the Surgeon General of the GAF in the person of Professor Dr. Hans Luxemburger, was appointed. Prior to this, the special position had not existed. It was his task to advise on psychiatric problems in aviation medicine, to prepare certain circular letters for medical officers and to select psychiatrists for the following types of assignment:

- (1) Luftwaffe Lazarett. All the larger hospitals, in and outside Germany, had a neuropsychiatrist, with the rank of Major or Captain, in charge of the section for psychoses and neurological diseases. The psychiatrist served as consultant to other sections including the Sichtungs Abteilung, except in rare exceptions, where the latter was

provided with a psychiatrist (Halle-Döhlau).

- (2) Luftgau. Attached to each Luftgau and also to some Fliegerkorps there was a psychiatrist with responsibility for matters concerning mental hygiene and the morale of the troops (Wehrbetreuungssanitäts Offizier or Medical Officer for Mental Hygiene). In small Luftgau's he could be the Lazarett-psychiatrist. Moreover, a neuro-psychiatric administrative assistant was sometimes assigned to the staff of a Luftgau for handling of records which were forwarded to the Office of the Surgeon of the G.A.F.
- (3) Sichtungsstelle. This station was independent of the Luftwaffe Lazarett. It was set up chiefly for the screening of fatigued or otherwise disturbed flying personnel. A neuropsychiatrist was attached or could if he had additional experiences in internal medicine, be chief of the center. This was the case, for example, in a 40 bed hospital at Oslo, Norway, where examinations for flying fitness of new candidates, usually the task of the Untersuchungsstelle, also were performed.
- (4) Untersuchungsstelle. In centers where many examinations for flying fitness were performed, particularly before the war, a neuropsychiatrist was assigned. If this was not the case, the psychiatrist of the nearest Luftwaffe Lazarett assisted, or the leader of the Untersuchungsstelle took it on himself to evaluate personality.

b. Training. There was no special training for psychiatrists in the Luftwaffe except for the Officers for Mental Hygiene (see Part 12, Mental Hygiene and Morale). The teaching of neuropsychiatry to other medical officers was greatly encouraged. The Lazarett psychiatrist gave clinical demonstrations for the members of the staff, and outstanding men were invited to lecture at Berlin and Jüterbog. It was stated by several informants that the Luftwaffe had the better neuropsychiatrists but that the number of well trained men was by far too small to meet the needs.

c. Selection. The neuropsychiatric examination to determine fitness for military aviation was performed at the Untersuchungsstelle. It was intended that this would be done by specialists, but often, and especially during the latter part of the war, the equivalent of the American AEE was given by other Luftwaffe medical officers. In the opinion of many informants this led sometimes to faulty selection. Candidates were applicants from the Army or from ground personnel of the Luftwaffe, many of them with combat experience. Long standing interest in aviation, especially as evidenced by participation in the aviation (glider) branch of the Hitler Youth Movement, was considered favourable.

- (1) The criteria for psychiatric selection and the methods of examination were set forth in a

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general directive which was published by the Aviation Ministerium and the O.M.L. in 1942 (10). A translation of this document has been distributed by the Aero-Medical Intelligence Section of USSTAF. It provided that an evaluation of personality, character and intelligence be obtained by means of a personal interview. Simple methods were employed to test retention and memory, arithmetical and technical skill and sense of spatial orientation. Finally, the military and sports accomplishments record, the analysis of handwriting, the candidate's previous history, family and racial origin were reviewed. It was emphasized that a good personal history, healthy ambition, sense of comradeship, and manual skill hold better promise for success in aviation than intellectual accomplishment. A point score system was not used in the evaluation of these functions.

- (2) A candidate could be rejected, temporarily rejected or accepted for military aviation. In the last case he could be declared suitable as radio-operator, engineer-gunner and aerial gunner (Fliegerschutztauglich), or in addition as pilot, observer and bombardier, (Wehrflieger-tauglich). These conclusions were submitted to the training unit commander who was limited only in so far as he could not employ an individual of the first category for pilot, observer or bombardier. Upon later re-examination, as after a period of combat, it occasionally occurred that temporarily a pilot was no longer acceptable in the second category and hence for some time flew as a gunner.
- (3) Besides the directive mentioned, no other outline has been found. It is believed that a rigid system of psychiatric selection in all probability did not exist. For some time it was thought by many psychiatrists that the body-character-constitution system of classification (Kretschmer) would be of value in selection and that the athletic and asthenic types would make better fliers than the pycnic. However, this idea was later abandoned. Several opinions, many contradictory, were given regarding the reasons for discontinuation of the separate and purely psychological test-examination which formerly in some cases led to rejection of medically acceptable candidates. Nevertheless with or without psychological tests, it was claimed that flying personnel was the very best of German military manhood.
- (4) With regard to neurological selection, a history or evidence of organic disease of the nervous system was definite ground for rejection as was also a history of psychosis or a clinically manifest psychoneurosis. Special attention was

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given to the detection of any signs of epileptic predisposition but electro-encephalography was not used. On the other hand it was emphasized that several minor abnormalities in the neurological examination, such as slight asymmetry of pupils and reflexes, had no clinical significance and should not be cause for rejection.

d. Fatigue, Combat-Fatigue, Anxiety Reactions and Psychoneuroses. Concerning the incidence of this type of disturbance, a great variety of opinions existed. The attitude encountered varied according to political orientation level and type of professional training. Among these attitudes were noted an unwillingness to admit that such pathology occurred, a tendency to minimize the importance of the problem, overemphasis of the organic approach (often based upon poor understanding of emotional motivation), and finally objectivity and realism.

- (1) A typical study of "over-fatigue" can be found in a report on 85 cases hospitalized at the Luftwaffe Kurlazarett Oberschreiberhau (24). The disturbance of these men, chiefly pilots, is called by the author "having flown too much" (Überflogensein) or "having lost zest through exhaustion in flying" (Abgeflogen sein). Nevertheless, it is pointed out that there was no correlation between the number of hours in the air and the severity of the condition which in all cases developed following an emotional trauma. The clinical description, otherwise, has much in common with Armstrong's aeroneurosis to which reference is made. The most outstanding symptoms were irritability, sleep disturbance (with dreams about the traumatic episode), sweating, headache, anorexia, loss of weight, hyperreflexia, tremor of the hands, dermatographism, eosinophilia and cardiovascular lability (often with bradycardia). The series of 85 cases are composed of: instructors (30); bomber pilots (28); reconnaissance fliers (5); fighter pilots (8); transport pilots (4); and aviation students (10).
- (2) It is commented that the students had gone through an exceptionally rigid and hurried course and that the instructors had suffered greatly from the hazards of flying with beginners. Of the remaining patients, some had crash landed in combat several times, others had been wounded and some had been prisoners of war in France. In spite of the appreciation of these experiences as probable causative factors, psychotherapy is not even mentioned in the treatment which consisted merely of sedation, sports, hydro- and heliotherapy.
- (3) Pathophysiology of the vegetative regulating nervous system was considered, generally, the essence of this fliers disease. Characteristic of the organic approach is also the research done by Hollwich who used capillary microscopy as a diagnosticum for flying fatigue. This

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condition, according to him, is based on increased permeability of the capillaries which results from moving at great speed. "Auxine-substances" which decrease the permeability, were thought to be of therapeutic value. Another method of recording the physiological substrate of fatigue in fliers, though by no means specific, was electro-encephalography.

- (4) Nomenclature. The report from Schreiberhau (24) is the only clinical publication on the subject of fatigue-reactions which could be found in Germany. Officially it was agreed among military psychiatrists in 1944 to eliminate the word psychoneurosis, including anxiety reaction. Instead, one of two diagnoses had to be used, first: psychic condition, psychogenic and psychologically fixed (abnormal reaction to external situations and inner conflict reactions) and second: physical conditions of psychic origin, including organic neuroses and primitive conversion neuroses. This to some extent explains the claim that there were no neuroses in the German military organization. Certainly, the classical war-neuroses with conversions, severe tremors and so on, were rarely seen in the Luftwaffe and considerably less frequently in the Army than in World War I. "Psychic conditions, psychogenic and psychologically fixed" however, were by no means rare and a large machine was set up to deal with them. Whereas the expression of complaints in the emotional sphere in all probability was greatly suppressed, anxiety and conflict manifested themselves indirectly as prolonged disability following brain concussion, psychosomatic conditions, sexual anomalies and suicide.
- (5) Occurrence and Causes. Combat-fatigue was seen in the beginning and with increasing frequency in the later stages of the war. At first, flights over water were feared, in general, more than flak. Later, when bombing missions were no longer made, the fighter pilots were affected more frequently. Many hours of alert, spent in the aircraft waiting in readiness for attacks which often did not materialize, and several combat missions daily for weeks in a row, were the best known causes for breakdown. In addition, non-military conflicts, such as worry about home, had a bad influence. According to Prof. Luxemburger, the condition was encountered more often in officers than in the non-commissioned. An exception in this respect were discouraged radio-operators who after 200-300 missions had lost their confidence and ambition.

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- (6) Symptomatology. In addition to the ordinary symptoms mentioned in the Schreiberhau report, the following was observed: a particular infantile, oversensitive behaviour which was called "Verprelltheit", severe depressive states; psychopathic reactions; marked gastrointestinal disturbance, particularly gastric dysfunction; neuro-circulatory asthenia, acrocyanosis and vasomotor rhinitis.

- (7) Prevention. After some experimentation, the use of Iervitin was completely discontinued. The effects of the drug were found to be unpredictable. A caffeine-cardiazol tablet (0.05 and 0.1 gram respectively) for combating sleep was available but it was not popular. Knowledge of any other drug which was used to improve performance or to counteract physical fatigue, was denied. The commanding officer of the unit, the Mental Hygiene Officer, and the field medical officer, were primarily responsible for the prevention of emotional disturbance leading to fatigue reactions. After severe experiences, especially grave losses in the outfit, a furlough (at a rest-home or with the family) was recommended. The alert periods of fighter pilots were limited to 4 hours, and one day per week was set aside on which the individual under no circumstances would take to the air. Shortly before the end of the war, plans were ready which provided for longer rest periods after a certain number of missions.

- (8) Treatment and Recommendations. Individuals suspected of combat fatigue were referred by the field medical officer to an Untersuchungsstelle, or, if hospital-observation seemed indicated, to a Sichtungsstelle, or Sichtungs Abteilung (12). The physician in charge of the station made one of the following recommendations:
 - (a) Return to duty.
 - (b) Furlough at home, 2-4 weeks.
 - (c) Erholungsheim (Kurheim) for a period of 3 weeks. The treatment was predominantly medical, plus a healthy diet, and sport in the open air. Convalescent installations of this kind were in Berwang (Tyrol), Kitzbühl (Austria) and Bad Schachau (near Bodensee), each with 200-400 beds. The duration of the stay could be prolonged on advice of the Kurheim physician. Psychiatrists were not assigned but the chief medical officer had received some special training and did superficial psychotherapy "when necessary".

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- (d) Kurlazarett Rest in bed, intensive medical treatment and a stricter regime than in the Erholungsheim, were the policy here. A psychiatrist was not attached and psychotherapy, if performed at all, was superficial. There were two Kurlazarets, Oberschreiberhau and Wildbad.
- (e) Treatment in the Sichtungsstelle (or Abteilung). The medical officer in charge could keep a patient at these stations for treatment, but this was the exception.
- (f) Psychotherapy. Within the GAF installation, only at the Sichtungs-Abteilung at Halle Döhlau was more extensive psychotherapy performed. (Stabsarzt Hattingberg). Here there were 30 beds for patients receiving psycho-catharsis, hypnosis, brief analysis and group psychotherapy. Narcosis was not used in psychotherapy, nor was shock-treatment. Severe psychoneurotic conditions with fixed symptoms (stuttering) were referred for psychotherapy to Prof. Göring in Berlin. Approval by the Surgeon General of the GAF was needed and the number of cases thus referred was claimed to average only 3-5 per month.
- (g) Suspension from flying. This could be recommended by the leader of one of the examining stations for a certain period of time (approval by a higher medical authority was needed if for more than 2 weeks), or permanently (only if upon re-examination other measures were found to have been ineffective). Personnel suspended from flying because of a diagnosis of fatigue were kept in the Luftwaffe and were re-examined when the period of temporary suspension expired. However, individuals whose primary intent seemed to be avoidance of hazardous duty and who failed to present objective evidence of pathology could be transferred to the Infantry. This was meant and understood as punishment. Furthermore, a directive of the Surgeon General of the GAF (14) advised that individuals "of good will but handicapped by psychogenic disturbances" be transferred for military therapeutic re-indoctrination to a special Flak Replacement Unit.
- (9) Rate of incidence. No statistical records on the incidence of the above reactions, have been found. The following estimates were produced from memory by the principal informants:
 - (a) 2% of all flying personnel were hospitalized

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because of combat fatigue and 10% of these became permanently unfit for flying (Luxemburger).

- (b) 15% of all permanent disqualifications for flying were on a basis of combat fatigue (Geyer).
- (c) 20-30% of the flying personnel on the Russian front received medical attention because of marked fatigue reactions. In general 15% of those hospitalized for this disturbance were ultimately disqualified for all flying (Villinger).
- (d) Every month 2-5 cases from the Sichtungsstelle in Oslo were transferred to Halle Döhlau for psychotherapy (Bingel).

- (10) Most informants expressed the opinion that, except for very rare cases, conditions of fatigue or psychogenic reactions due to combat flying, never were so severe as to disable an individual permanently for any type of military duty.

e. Neurology.

- (1) During the war accidents in aviation as well as from missiles rendered head and brain injury a problem of the utmost importance. W. Tönnis, Chief-Neurosurgical Consultant to the Surgeon General of the GAF, who also served in the Army in the same capacity, was the organizer of a comprehensive program. Groups of specialists (in neurosurgery, psychiatry - E.E.N.T., pathology and maxillo-facial surgery) called "Tönnis-Bereitschafte" were sent by air to forward lazarets in active theaters. After initial treatment lasting 3-4 weeks patients were flown back to special hospitals inside Germany (for instance to the "Fach-Lazarett" with 2,000 beds for brain injuries which was located in Berlin and was later moved to Bad Ischl).
- (2) The principles of war-neurosurgery were laid down by Tönnis in a manual (29) and were didactically treated in a series of excellent films. These were distributed to each Luftgau and special Lazarett. Early and vigorous antiseptic treatment (sulfanilamide, tibatine and cibazol), extensive cleansing of the border regions of the wound and complete spinal fluid drainage under evipau-narcosis at the earliest sign of meningitis were held responsible for the good results achieved. Of 929 cases of brain wound 33% died, 13% remained in need of care, but the remainder (54%) returned to either full duty or labor in the service. Only 10% of 120 cases of brain wound with primary opening of the ventricle, died.

- (3) Extensive aftercare was given to those patients with residual defects. In special installations (at Bad Ischl, Bamberg and Lohr) a program of occupational therapy, elementary instruction, speech lessons, calisthenics, sports and electrotherapy was of great value in attempts to reduce the number of cases ultimately disable as a result of aphasia and paralysis. The ability to relearn and other phenomena demonstrated in these patients, promoted a skeptical attitude towards the rigid theories of brain-localization advanced by Kleist and other neurologists after World War I.
- (4) Closed head injury, particularly brain concussion, presented the next important subject. In a directive dated December, 1944, the Surgeon General of the GAF re-emphasized that all flying-personnel having suffered from concussion of the brain must be given absolute rest in bed for at least three weeks (14). Neglect of this rule had caused unfitness for flying which in many cases lasted for one half to one year. Post-concussional headache and oversensitivity to acceleration accounted for 16% of all admissions to the Sichtungsstelle.
- (5) The clinical differentiation of the post-concussional state from psychogenic conditions was a frequent difficulty. During the war an estimated 500 cases yearly were referred to the Kaiser Wilhelm Institute for Brain Research at Berlin-Buch. The bio-electrical recording of pre-epilepsia often furnished evidence of traumatic brain damage.
- (6) The pathological examination of gross cerebral specimens obtained through death from head injury was also performed at Berlin-Boch, where all such specimens were sent. The pathologist Hugo Spatz reported the findings at a meeting of the Luftwaffe pathologists (23). The most frequent complications he mentioned were, first, Abscess, second, Polioencephalitis and third, Pyocephalus. Others discussed the high incidence of traumatic meningitis following head injuries in which the impact comes from the front, and traumatic meningitis referred to by them as "the second week cause of death" in cases of gunshot wounds of the skull.
- (7) The diagnosis of tetany as the basis for rejection of 23 candidates out of 1050 examined at the Untersuchungsstelle II/IV during 1942, caused considerable concern and resulted in an investigation being ordered by the Surgeon General of the GAF. This investigation by Roeder brought out that the diagnosis had been made on insufficient grounds, namely a positive facialis sign

(Chvostek). This, and disturbances following five minutes of hyper-ventilation were considered to justify a diagnosis of latent tetany. But it was argued that these phenomena in the absence of other signs, might be merely evidence of a vegetative labile constitution with tendency to tetanoid reactions. They then were not to be considered a basis for declaring the individual unfit for flying, unless the altitude test which in such cases was immediately indicated, justified rejection.

- (8) A new problem was presented by the high incidence of cerebral haemorrhage at early ages (20-35 yrs) of which hypertension or kidney disease was not the cause. The possibility that the condition resulted from severe emotional trauma of war, perhaps superimposed on vascular weakness was stressed.
- (9) Arteriography was widely accepted as a valuable diagnostic method. Whereas paravenous particles of thorotrast were believed to demonstrate carcinogenic potentialities, its administration was temporarily prohibited. Later however, it was again given preference over "Vasoselectan", another contrast preparation.
- (10) Polyneuritis, primary, or as a complication of diphtheria, (also wound-diphtheria), typhus and other infectious diseases, was frequent and of a severe type. Especially post-diphtheritic neuritis was feared because of its often fatal course or residual and irreparable muscular atrophy, which developed in spite of timely and adequate treatment with therapeutic serum. Several neurologists were of the opinion that malnutrition and the abuse of alcohol of poor quality, had lowered the resistance of the peripheral nervous system of the people affected. The high incidence of benign polyneuritis after immunization against typhoid and paratyphoid, as well as neuritis of the shoulder plexus after treatment with tetanus serum, was explained on the same basis.
- (11) Insulin subshock treatment and sympathectomy for Causalgia were regarded as the most spectacular therapeutic developments in the treatment of peripheral nerve-injuries.

12. MILITARY MENTAL HYGIENE AND MORALE.

a. General: It has been stated in the part on neuropsychiatry of this report that the absence of classical symptoms of war neuroses coincided with the appearance of other manifestations of disintegration of emotional life.

- (1) As an example can be mentioned the paralyzing

and disabling fear or belief of having acquired a venereal disease. This abnormal concern, known as Lueophobis caused considerable loss of days of duty. Hospital admissions because of persistent itching in the absence of organic skin disease, but associated with the particular phobia were frequent. At the Luftwaffe Lazarett of Paris-Clichy therefore, the routine was established that every case of itching in which a dermatological diagnosis could not be made readily, was referred for psychiatric consultation.

- (2) Sexual impotency, experienced in particular when home on furlough, was a wide spread disturbance. Psychogenic factors played as much a role in the causation of this disturbance as did physical exhaustion which often was suggested as an explanation. That the latter was not accepted can be derived from the fact that strange rumors found many believers, enough to endanger the morale of large units. For instance, among troops it was told that substances which reduces sexual libido was put in the food.
- (3) Homosexual acts, their medical evaluation and prevention, were subjects of a special directive from the Surgeon General of the GAF. The marked increase of incidents of this nature, together with prejudiced handling and insufficient consideration of medical psychiatric aspects in the military courts, were said to have resulted in unjust sentences and had become a serious concern. Cases of young, psycho-sexually immature individuals, whose behaviour was to a large extent the result of environmental factors and depression, were frequent.

b. Suicide was a grave and most alarming phenomenon. In October 1940 Prof. Goring reported that in the Luftwaffe during a period of 1½ months not less than 79 suicides and suicide-attempts had occurred. Elsewhere reference (15) was made to a study on "Several hundred" of cases of suicide in the military service. A special directive from the Surgeon General of the GAF in 1941 (11) deals exclusively with the prevention of suicide. It was reprinted and distributed again in 1942.

- (1) Absolute figures on the rate of suicide have not been found.
- (2) The incidence of suicide was relatively higher in the Army than in the Luftwaffe.
- (3) Causes for suicide in the military service prior to 1942 were:

	Army & GAF	GAF alone.
insanity... ..	38	25
psychopathic personality	17	27
exaggerated sense of		
honor	2	7
fear of punishment ...	10	19

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	Army & GAF %	GAF alone. %
Alcohol intoxication ...	19	12
others	14	10

The lower percentage of suicide on the basis of insanity was interpreted by Prof. Luxemburger as evidence of the better psychiatric selection in the Luftwaffe. That individuals with a strong drive for personal dominance ("Geltungsbedürfnis") willfully had worked their way into the GAF, was offered by him as an explanation of the figures on the second and third line. The inflated sense of honor which rendered even the slightest failure in military conduct unbearable, and incompatible with life, was a noticeably frequent cause among young and immature officer candidates.

- (4) In the Luftwaffe 91% of all suicides were committed by non-officer personnel.
- (5) After elimination of the cases of insanity, the statistics showed that 60% of the individuals involved had military service records with above-average rating.

c. Medical Officers for Mental Hygiene. (Wehrbetreuungs-Sanitäts Offiziere)

- (1) Training. These specialists were trained at the Deutsche Institut für Psychologische Forschung und Psychotherapy in Berlin. The four-weeks course for psychiatrists and Luftwaffe physicians with some psychiatric experience was initiated in 1940. Prof. Dr. M.H. Göring, Oberstarzt and member of the Advisory Council of the O.K.L. was in charge. Teaching was done by outstanding Luftwaffe psychiatrists and by staff members of the Institute, which was a center for training of civilian psycho-therapists and for psychological research. The subject matter included:
 - (a) Physical basis of emotions.
 - (b) Psychology and character.
 - (c) Social psychology.
 - (d) Psychology of motivation.
 - (e) Psychoneuroses.
 - (f) Marital hygiene.
 - (g) Psychology and military mental hygiene.
 - (h) Educational programs at an air base.

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- (i) Military psychiatric reports.
 - (j) Mental deficiency.
 - (k) Suicide and its prevention.
- (2) The Duties of the German Officer for Mental Hygiene corresponded for the greater part, to those of the psychiatrist in the Army of the United States as outlined in W.D. Circular No. 81, par. III, 3 13 March 1945. He advised the Command on matters of job assignments, furloughs, training schedules, motivation of A.W.O.L. cases, prevention of psychogenic reactions and suicide. In addition every three months, and later every month, he had to prepare a statistical report on the incidence of venereal disease, court martial offenses, suicide and other manifestations of poor morale in the area under his care. These reports were sent to the Advisory Council of the O.K.L. to be used by Prof. Goring and his staff as material for quarterly bulletins containing statistics and instructions on policies of mental hygiene. These bulletins were classified "secret"; they were sent to the Luftgau Officers for Mental Hygiene and were said to have been destroyed.
- (3) The semi-political mission of the Medical Officer for Mental Hygiene, however, became quite obvious in 1944. At that time the course in Sanitäts-Wehrbetreuung was reorganized under Prof. Goring in Munich. The attendance was restricted to Mental Hygiene Officers who had been members of the N.S.D.A.P. since 1934. Upon completion of the course, these men were assigned to the special task of strengthening morale; they were given the title of National Socialistic Fuhrungs Sanitäts Offizier, abbreviated as N.S.F. San. Offizier (Medical Officer with the function of National-Socialistic Leader).

d. Military Courts. A continuous source of concern to the Mental Hygiene Officer and other Luftwaffe psychiatrists were the Special Courts ("Sondergerichte") which dealt with military personnel accused of political disloyalty. In addition, trials because of serious charges such as repeated A.W.O.L., insubordination towards superiors, rape and desertion, routinely required a psychiatric examination of the accused with a report for use in court. A manual for this procedure of military psychiatry was written by Prof. Luxemburger (20). The booklet contains a technical discussion of psychiatric and psychological factors which should be taken into consideration when an individual was to be tried in a military court.

e. Morale at the end of the War.

- (1) The common opinion of the psychiatrists interviewed was that in view of the severity of the losses suffered and the evidence of defeat, the morale in the GAF had remained at a high level surprisingly long. According to them prior to the collapse, the average GAF personnel had been

carried morally by the proud assumption that he was a member of the best part of the best army in the world, by his political ambition, or by both. Direct and indirect manifestations of a break of morale were admitted but did not allow conclusions because of the absence of accurate information regarding the rate of incidence.

- (2) It was claimed that the fighting spirit was as a rule on a high level. The team-spirit of aircraft crews was much praised. As a constructive element in this respect, was considered the fact that a man's position in the crew was not related to his military rank. The morale of the GAF furthermore was promoted by the extra pay for flying personnel; this was, regardless of rank, 75 marks per month, which was granted primarily to allow for adequate food. It was stated that similarly the good medical care had a morale-building effect. In spite of all shortcomings, the psychiatric service of the GAF was superior to its equivalent in the Army.
- (3) According to the statement of most informants the final collapse in the GAF did not occur until late. About the question of what events were actually most detrimental to morale, the psychiatrists were divided into two groups. The first claimed that the belief in the leadership was unimpaired, that the fighting spirit never went down, but that the GAF was forced to give up because of lack of fuel and the superiority of Allied fighters. The second group insisted that obvious misinformation by high authorities, like that about Stalingrad and the impregnability of the Atlantic Wall, previously had destroyed the last remnants of confidence in the regime. This, however, it was said, affected only to a minor degree the spirit of those GAF members who were more devoted to the military profession than to the cause of the war.

13. AERO-MEDICAL RESEARCH IN THE GAF.

a. Scope. According to the Surgeon General of the GAF the German conception of the scope of Aviation Medicine was very broad. It encompassed all those conditions which might in any way affect the physical or mental well being of GAF personnel as well as those which might in any way be connected with the task performed by Air Force personnel. Thus in addition to the usual Aviation Medical Research the GAF actively supported in their own facilities research on such subjects as the effects of bomb blast, Malaria and Typhus control, infectious hepatitis, physiological and psychological aspects of the aircraft gun sights, physiological and psychological aspects of glide bomb sighting, psychological effects of terror bombing and many other

subjects often considered remote from Aviation Medicine.

b. Fundamental Research was always encouraged as, according to their ideas on the subject, very often those problems which appeared only remotely connected with Aviation Medicine at one time might with the rapid advancement of the Science of Aviation furnish very important data for use in connection with new techniques which could not have been contemplated at an earlier date. It was their policy as far as possible to have basic data at hand which could be applied in any contingency.

c. Organization of Aero-Medical Research Facilities. Aero-medical research was sponsored and directed by two high echelon agencies - the office of the Surgeon General of the GAF and the Forschungsführung d. Luftwaffe, Appendix XVI. The Forschungsführung d. Luftwaffe was a general civil aviation research organization functioning directly under the Ministry for Aviation and interested in all phases of the Science of Aviation. Its director was Prof. Georgii. This organization corresponded in many respects to the N.A.C.A. of the United States. Coordination between the Aero-medical research activities of the Office of the Surgeon General of the GAF and the Forschungsführung d. Luftwaffe was accomplished by a "Referat" or consultant in the person of Stabsarzt Becker-Freyseng. In addition to the research performed directly by the facilities of the Surgeon General of the GAF and the Forschungsführung d. Luftwaffe many problems were allocated to civilian installations operating under the Ministry for Education. In these installations which in most instances were Universities, Medical Schools, or Institutes, comparatively small groups were formed for research in Aviation Medicine. The members of the groups were given commissions in the Medical Service of the Luftwaffe, and furnished with apparatus and material. They were supervised by the Office of the Surgeon General of the GAF. Often they would carry on with their usual teaching and research activities devoting only part of their time and effort to problems of Aviation Medicine. Often technical personnel were paid by the Ministry of Education while materials etc., were furnished by the Office of the Surgeon General and the Forschungsführung d. Luftwaffe. Thus much of their work was decentralized into many areas and there was much overlapping of jurisdiction. However, the organization seemed to function without too much friction.

- (1) A list of Research installations, their location and the person in charge is attached in Appendix XVII.

d. Budget. The amount of money spent by the German Government for research in Aviation Medicine is very difficult to ascertain due to the overlapping of the function of the Ministry for Education, Office of the Surgeon General of the Luftwaffe, the Forschungsführung and certain endowed institutions. The Surgeon General's budget was about 600,000 Marks per annum. This did not include any money for personal equipment research as that expenditure was carried by the Technicalate of Research on Protective Equipment. Personnel were paid partly from the budget of the Surgeon General but also at times from the budgets of the Ministry for Education and other branches of the Luftwaffe and by endowments such as those of the Kaiser Wilhelm

Institute and the Robert Koch Institute.

e. Facilities for Research. In general those facilities for Aviation Medical Research visited during this investigation seemed quite good. The personnel employed seem to have been well selected and highly motivated. The ability of such men as General Rose, Prof. H. Rein, Prof. Strughold, Dr. S. Ruff and many others cannot be doubted. There were isolated instances in which certain individuals who were interviewed seemed more enthusiastic than brilliant. However, such individuals can be found in many research establishments and their enthusiasm unrestricted by dogma has at times proven of value.

- (1) Documents furnished by the Engineering firm of J.O. Zeuzen who built altitude chambers for the GAF lists 30 chambers constructed for the Luftwaffe between the years of 1930 and 1945. Two included explosive decompression locks and several included temperature control. In addition 4 motorized mobile chambers were built. Also chambers were captured from the Russians and placed in operation by the Germans. Four of the Luftwaffe chambers could be cooled to -55°C. A list of the chambers, their type and location is attached in Appendix XVIII.

f. The Type of Research performed in the field of Aviation Medicine closely paralleled that performed in the U.S. However, as has been stated their scope was somewhat broader than ours. A description of their work and findings which exactly paralleled that in the U.S. has been deleted and only those studies and findings of particular interest described. Most of the important and interesting research in psychology has been described in part 10 of this report. Likewise that in neuropsychiatry has been treated in part 11.

g. Altitude Acclimatization.

- (1) As it was generally believed that individuals living at high altitudes develop a certain degree of acclimatization Dr. A. Frank and co-workers of the GAF observed the effects of living at high altitude upon a group of GAF flying personnel. Selected individuals who were expected to be used for reconnaissance and photographic missions were allowed to live under excellent conditions in the mountains at an altitude of 3,000 meters (10,000 ft.) for periods of at least 10 days. During this period the personnel were given much physical exercise such as skiing, mountain

climbing, hiking and other types of physical conditioning. Their food was of the best obtainable and was especially high in butter and egg components. Wine and beer consumption was limited. They were forced to get long hours of rest. At times they were allowed to have their wives with them for at least a part of the period.

- (2) It was demonstrated that such a procedure increased altitude tolerance about 1,000 meters (3,300 ft). Handwriting (the Lottig test) was used as the criterion. It was further believed to have been demonstrated that such an increase in tolerance could be maintained by daily exposure to 5,000 meters (16,700 ft.) altitude in an altitude chamber for a period of one hour. It was believed that such acclimatization would last as long as six months in some individuals. Red blood cells were increased in number and hemoglobin in concentration. It was considered adequately demonstrated that incidence of aero embolism at altitude was reduced.
- (3) Some of the German investigators questioned about their impression of the procedure pointed out that the ideal living conditions the forced rest and physical conditioning undoubtedly played a part in the beneficial results achieved.

h. Treatment of Shock Following Prolonged Exposure to Cold by Rapid Rewarming.

- (1) In the opinion of the Surgeon General of the Luftwaffe one of the most important achievements of the Luftwaffe research was the work which pointed the way to the rather revolutionary procedure of rapidly rewarming those individuals who were in a state of collapse following exposure to cold. According to Prof. G.A. Wertz, he himself became very much interested in the problem in 1942 because there was no standard method for treatment of those individuals taken from the sea who were in serious condition. The work of Lutz and von Wertz prepared the way when they demonstrated that animals cooled to from 13°C to 16°C could be revived

by rapidly rewarming them in a bath of water heated to from 40°C to 45°C. In the severe cases the heart has to be aided by electrical stimulation and anoxia prevented by rhythmic artificial resuscitation using air under one atmosphere of positive pressure.

- (2) According to Lutz and Weltz cases of recovery of GAF and Marine personnel following such methods of treatment are known to have occurred but no careful compilation of case studies could be made because of the breakdown in communication in the latter part of the war. These same investigators stated that their was a directive from Luftwaffe headquarters instructing personnel that rapid rewarming in a water bath at 40°C to 45°C should be attempted in those individuals suffering from severe exposure to cold.
- (3) It was the opinion of those investigators interrogated that the method should always be tried and that those dying from the so called rewarming shock would die anyway, consequently nothing was to be lost and much was to be gained. Major Leo Alexander has compiled an extensive report following his investigation of the subject (7).

i. The Paradox Effect.

- (1) The so called paradox effect is a phenomena which can be demonstrated in certain individuals after they have breathed a gaseous mixture of 93% nitrogen and 7% oxygen for a period of from three to five minutes following which they are suddenly switched to the breathing of pure air or pure oxygen. In about 3% of personnel studied by investigators, in the GAF tetany, carpel spasm and unconsciousness occurred in ten to twenty seconds after they began to breathe pure air or oxygen.
- (2) The same phenomena can be produced in the altitude chamber if the 7% oxygen 93% nitrogen breathing procedure is replaced by a chamber flight, without oxygen, to a level of about 18,000 to 22,000 ft. for a period of time followed by a sudden switch to pure air or oxygen. It

was believed by many responsible investigators in the GAF that such a situation occurred in flying personnel after they had been flying for periods of time or for some reason or other had become slightly anoxic and then switched on pure oxygen or high content oxygen mixtures. Consequently they selected out individuals so effected. They believed that individuals demonstrating this reaction were poor risks as flyers.

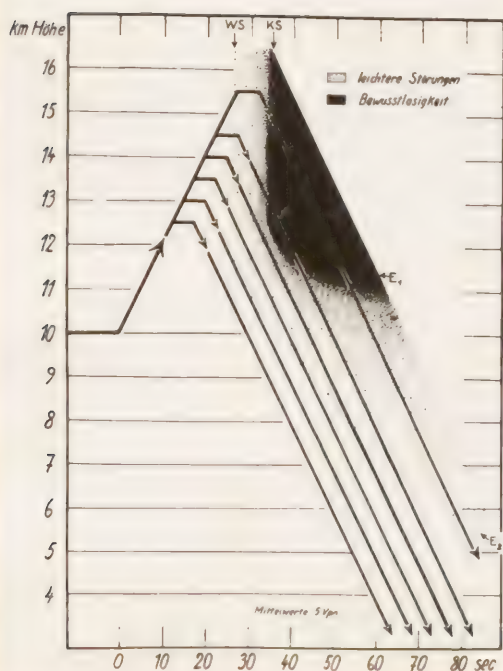
- (3) The scientists interrogated were at a loss for an explanation concerning the reason why the American Air Force had never experienced such situations but believed it to be due to the fact that similar studies were not made at levels of 18,000 to 22,000 ft. or with a gas mixture of the exact type they had employed.
- (4) The German investigators had never found a correlation between susceptibility to the paradox effect and any other physical finding. They stated that in their studies they had carefully ruled out hyperventilation.

3. Study of Time Periods Flying Personnel Can Remain at Extreme Altitudes with 100% Oxygen.

- (1) The advent of the jet and rocket propelled aircraft brought about a rather profound change in aviation medical studies relative to high altitude operation. Aircraft of "Natter" type (experimentally flown) were single seater, rocket propelled aircraft capable of climbing to extreme altitudes at rates up to 37,400 ft. per minute but capable of remaining in the air only for a few minutes. Maximum sea level speed was 620 miles per hour. Take off was with rockets and a force of 1.5 g. was experienced. The "Natter" aircraft was designed for ramming attacking aircraft and thereby destroying them. There was no landing gear consequently the pilot after his mission had to parachute to earth. He was well protected during his crash and left the aircraft simply by pulling a lever which allowed the craft to disintegrate in sections about him. The tail section which contained the rocket mechanism was also brought to earth by parachute. Due to this arrangement, the

function of the aircraft and the weight restriction, pressurization was out of the question. Therefore the problem was what flight pattern must a pilot follow if he is to return safely from such an extreme altitude mission.

- (2) The results of the study to solve this problem are presented in an excellent diagram by Prof. Strughold. This diagram illustrates the necessary speeds of ascent and decent and the length of time the individual can remain at the selected altitude as well as the state of his consciousness which can be expected under the circumstances.



Leichtere Störungen =
mild disturbances.
Bewusstlosigkeit =
unconsciousness.
WS - KS = increasing
mental disturbance.
E1 - E2 Decreasing men-
tal disturbance.

k. Speed in Air War and the Physiological Latent Period.

- (1) According to German investigators (28), the great increase in speed of modern aircraft must focus more and more attention upon what they speak of as the Physiological Latent period which corresponds very closely to our conception of reaction time. It is their belief that we must consider in our personnel selection this latent time interval between perception of a stimulus by the receptor

and the final action which the stimulus provokes. They believe one must study the effects of anoxia and various forms of acceleration on reaction time. Their statement of the importance of reaction time is exemplified as follows:

- (2) If the two aircraft are approaching each other at a speed of 500 miles per hour and one sights the other to shoot, the aircraft will be hundreds of feet away from the spot where he sighted it when the bullet arrives because his physiological reaction time will be about $1/5$ of a second, the trigger mechanism reaction time another $1/5$ of a second the speed of the bullet another fraction of time.
- (3) This conception of course is an old one but the great re-emphasis placed on it by the Germans is of interest. Also of interest are some of their new techniques employing muscle action potentials for the measurement of the so-called physiological latent period. Their particular studies were relative to the effect of altitude, acceleration, darkness etc., on the factor.

1. Night Vision.

- (1) The German investigators by direction of the GAF devoted much energy to the study of night visual efficiency. The group at the Medical Research Institute at Garmisch-Partenkirchen had studied especially cockpit lighting and monocular dark adaption. They concluded that dark red was not the color of choice for the maintenance of night visual efficiency but that a red of a wavelength about 6500 Å. was best.
- (2) They also concluded that monocular dark adaption was worth while and practical as continuous occlusion of one eye for hours or days gave better results than binocular occlusion for short periods of time - that is under one hour. Also of interest is their conclusion that dark adaption in winter is better than in summer and that heating the skin of the areas in the region of the eyes and forehead increases the speed of dark adaption.

- (3) Dr's Ingeborg Schmidt and H.W. Rose (25) performed an excellent study from the standpoint of experimental design and control relative to the use of many substances which other investigators had from time to time claimed would improve night vision. They concluded that caffeine, cardiazol, strychnin, ephedrine, octin, vitamin A in oleous solution, muscular exercise, supersonic waves and stimulants of taste neither improved nor caused deterioration of night vision in normal subjects.

m. Use of Aluminum Impregnated Cloth for Fire Protective Clothing.

- (1) Dr. T. Bensinger and co-workers have studied the use of an aluminum cloth for fire protective clothing. Dr. Konrad Buttner is given credit for the design. The cloth appears to be a light weight aluminum foil pressed into a light weight cloth. The theory upon which the suit was designed was that aluminum reflects radiant heat. Glass goggles were built into the loose fitting hood. It was worn with asbestos shoes and gloves. It is stated that with the suit which is light and inexpensive one can approach to within a short distance of fires of very great intensity. They also studied the use of the material for tents to be placed above aircraft during mechanical repair in the tropics.

n. Research on Insecticides.

- (1) Although five targets were visited, information on insecticides was obtained mainly from only one source. This target was the center for fever therapy located at Pfaferode bei Mulhausen. The institution was formerly located at the Tropical Medicine Division of the Robert Koch Institute at Berlin.
- (2) Gesarol or DDT was manufactured by the I.G. Farbenindustrie in their plant at Leverkusen near Cologne in two forms; Gix, a liquid; and Lauseto, a powdered form. The Germans learned of our use of DDT in the early part of 1943 and started producing and experimenting with DDT at that time.

- (3) Gesarol (or DDT) Substitutes are as follows: (1) Delicia, manufactured by Freiburg at Delitsch Saxony; (2) Russlo powder, manufacturer unknown; (3) Duolit, manufactured by "Gegesch (Deutsche Gesellschaft f. Schadlingsbekämpfung). of Friedberg, Upper Hessen; and (4) Xanthogenor, manufactured by Friedberg at Delitsch Saxony.
- (4) Experiments accomplished. The main experimentation accomplished at the laboratory visited was the use of DDT for the impregnation of clothing and the use of DDT in paint. The impregnation of clothing had been quite successful and was used operationally by personnel of the Wehrmacht in the field for lice control.
- (5) The use of DDT in paint was still in the process of experimentation and according to preliminary results was very successful. DDT in paint, applied to the surface of plastic boards, killed flies and mosquitoes for a period of 8 to 12 weeks. Several mixtures were tried but the best results were obtained with the following; Gesarol für Mischung (Pre-mixture of 33% Gesarol by Schering) 10 parts; chalk 20 parts; water 70 parts and glue 4 parts.
- (6) Toxicity of DDT. The toxicity of DDT was tested by injecting DDT into mice, intraperitoneally, intrathoracically, intracerebrally and by giving it orally. The only toxic results were found when DDT was given by mouth and in oil. It was found that it required 4.0 to 5.0 mg to kill a mouse and 250.0 mg to kill a guinea pig. DDT was believed to be a nerve poison. From other sources it was learned that one worker had voluntarily taken 2.0 gm by mouth with no toxic results. It was also reported that a farmer had taken 15.0 gm (by mistake) as a vermifuge with no toxic results. From other sources it was reported that DDT was toxic in milk and workers handling DDT were advised to abstain from drinking milk.
- (7) Toxic Effects of DDT on Insects. Dissection of insects killed by DDT resulted in the conclusion that DDT is found in the glands of internal secretion (thyroid, suprarenal, testes, etc). Insects are particularly vulnerable because of the fact that there is considerable lipid or fatty tissue in their outer coating.

o. Research on Infectious Hepatitis.

- (1) Generalarzt Rose (27) stated that German research during the war had in his opinion established that catarrhal jaundice and infectious hepatitis were one and the same entity. Although much investigative effort was made to correlate incidence of the disease with sanitation, with climate, with diet and various other factors no correlation which could not be offset by other evidence, was ever found.
- (2) The most infectious period was determined to be during the pre-jaundice stage. Ninety different viruses were obtained from patients with infectious hepatitis. However, there is no definite evidence according to General Rose that any one virus was the causal agent or that any of them were connected with the disease other than to have been present in the same individual.
- (3) At Bucharest a group used the peritoneoscope to remove small bits of liver substance from patients. This material was demonstrated to contain inclusion bodies.
- (4) One complete episode of the disease was believed to confer permanent immunity although there were often exacerbations of the original episode. Many tests including blood tests, liver tolerance tests and various physical studies were used in an attempt to find a usable criterion for return to duty, but none was ever found. The most reliable criterion was found to be good clinical judgement of the observing physician. The average case requiring hospitalization was lost to troop duty for a period of from six to eight weeks.
- (5) Some German investigators believed that jaundice following heavy metal treatment of syphilis was due to the provocation of a latent infectious hepatitis. They did not study the possibility that this observation might be due to infection from syringes which had been used on infected people.

p. Research in Malaria Prophylaxis with Drugs.

- (1) Twenty-one drugs were studied relative to malaria prophylaxis. Of these, atabrine given in dosage of .6 grams immediately after the evening meal (never on an empty stomach) was the drug of choice because there were fewer toxic reactions and it gave good protection.
- (2) Atabrine was found to have no effect on altitude tolerance and no effect on flying efficiency.

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- (3) Flying at altitude was found not to cause malaria relapse.

q. Cause of Death in Animals Following Simulated Long Range Parachute Drops.

- (1) Animals subjected to a simulated parachute fall from 30,000 m (100,000 ft.) died when reaching a level of 16,000 m. (53,000 ft.) to 12,000 m (40,000 ft.) Autopsy showed gas embolism of the heart.

r. Bacteriological Warfare.

- (1) Those persons interrogated all stated that studies relative to bacteriological warfare were concerned only with the defensive aspects. It was stated that an order signed by Hitler forbade the study of offensive bacteriological warfare. They feared most and consequently placed most emphasis on their studies against typhoid (they felt that the usual immunization measures would not protect against massive contamination), Cholera which could be spread very rapidly, and most of all rinderpest. Foot and mouth disease virus was considered so stable that it could have been possible to use it as a weapon of war. It was believed rinderpest could have been spread from aircraft. Certain agriculture pests were considered and feared - most of all the potato Beetle.

s. Use of Long Metal Pins in Treatment of Fracture of Long Bones.

- (1) Almost without exception the use of long metal spikes (called Kurschner Nails) driven down inside the shafts of long bones after proper alignment was volunteered as a major war-time achievement. Indications for use of the nail are, a) pseudoarthrosis, b) mal-aligned fractures requiring refracture or operation and c) shortening of limb due to a pathological process. In the latter case the limb was lengthened and grafts from the normal limb inserted while the nail held the parts in place.

t. Bombing Deaths.

- (1) Bombing deaths according to Dr. Dessaga who was charged with a study concerning them were due to:
- (a) Blast effect. Often the lung tissues were injured so severely that massive air embolism in the circulatory system caused death.

- (b) Fragmentation injury.
- (c) Carbon monoxide. Half of those who died during bombing and fire of Hamburg died from carbon monoxide poisoning.
- (d) Other poisonous products from burning such as acrolein carried into the lungs on dust particles.
- (e) Crushing by falling debris.
- (f) Dust. Dust concentration after explosion was thought to reach concentrations as high as 200-300 grams per cubic meter. One hundred grams of dust per cubic meter causes death in from 30-40 minutes. Thirty to forty grams of dust in the respiratory system can cause death.
- (g) Burning.

u. Vibration Effects.

- (1) Vibration levels from jet engines of the type used in buzz bombs are said to reach 180-240 phons (this was said by two investigators to be correct although it seems very doubtful) at a frequency 50-80 cycles per second. The vibration produces loss of patellar reflex in persons standing within an area of 3-4 meters. (In animals the cutting of the nerve fibres along the regional blood vessels prevents the loss of the reflex). According to Dr. Desaga the effect upon the respiratory system is a feeling of suffocation, the body tingles as though the parts are going to sleep and the head is vibrated in a manner which causes double vision.

v. Electroencephalography. Electroencephalography and its clinical application were further developed by Kornmüller at Kaiser Wilhelm Institut for Brain Research, Berlin-Buch. Comprehensive information regarding the normal and abnormal E.E.G. and its experimental foundation can be found in Kornmüller's book (18). Research in electroencephalography of interest to aviation medicine was performed on:

- (1) Acute Anoxia (Kornmüller, Palme, Strughold). Activation of alpha waves, followed by the appearance of 6 Hz. waves and finally 3 Hz. waves and the same phenomena in reversed sequence upon breathing of oxygen was considered characteristic. It was shown that the bio-electrical changes were actually caused by lack of oxygen and not by hypercapny though this, as well as hypocapny did influence the E.E.G. In animal experiments it was noted that even when anoxia is increased to the point of causing death, spikes do not occur. When interviewed Kornmüller stated that he would consider

changes in the human E.E.G. at altitudes below 20,000 feet or after 1 minute of hyperventilation as abnormal and ground for rejection. The E.E.G. and these criteria however, were not used in the examination for flying fitness.

- (2) The paradox effect. After anoxia the amplitude of the alphawaves (which reappear as a result of oxygen breathing) is reduced during the period of clinical symptoms of paradox effect. The bioelectrical changes, in harmony with other manifestations of this condition point to the diencephalon (hypothalamus) as the site of the disturbance.
- (3) Fatigue. Although not specific for any particular type of fatigue, the following electroencephalographic findings in conditions of fatigue (also present in some post-concussional states) are interesting. Contrary to the normal elimination of alphawaves through visual stimulation, it was found that when the fatigued individual opens his eyes, these waves -
 - (a) do appear if previously not present,
 - (b) are activated if previously weak or,
 - (c) are reduced to a lesser extent than normal if previously they were well developed.
 - (d) In addition to this phenomenon, the poorly developed alphawaves in the E.E.G. with eyes closed and their rapid disappearance after having been reactivated by opening of the eyes were considered evidence of more severe fatigue. Kornmuller points out that in all probability these findings could render possible a quantitative method of measuring fatigue (and fatigability).
- (4) Low temperature (Noell) The E.E.G. of rabbits showed slow waves if the body temperature was decreased to 30°, and spikes developed if lower temperatures were reached. Comparing the E.E.G. records with those of several forms of poisoning, similarity was found with eserine-intoxication. The presence of spikes in the E.E.G. at low temperature was considered to be a warning against the use of cardiazol in attempts to revive near-drowned human beings.
- (5) Diagnostic value of the Electroencephalographic procedure can be enhanced if after a lesion is grossly located by the usual technique of six leads, the abnormal lead area is focussed down upon by placing six leads in a small circle 2 - 3 cm. in diameter around that area and then studying it in the usual manner.

14. PERSONAL EQUIPMENT.

a. Belts and Harnesses.

- (1) No unusual type of GAF safety belt or crash and ditching harness was found.
- (2) The safety belt, which was in general use among pilots, was a combined waist and shoulder harness which was suspended from a single fastener, i.e. when the fastener was released both the waist and the shoulder straps fell away.
- (3) The fastener consists of a "V" shaped spring wire, fastened at the end of the right waist strap, which is indented in such a way that it engages a ring on the opposite waist strap. Pulling a webbed attachment disengages the fastener quickly and easily. It is possible that the fastener cannot withstand high decelerative forces such as would be encountered in an airplane crash. However, the simplicity of this device would justify its being examined and tested for possible application to our needs.
- (4) The other crew members of multi-seated aircraft employed harnesses which were similar to those of the pilot, but adapted to the crew position.
- (5) No ditching belt, as such, was found.

b. Anti-G Suit.

- (1) There is no evidence that the German Air Force planned to use an anti-G suit operationally. Early in the war a few models were tested and found to be unsatisfactory. Interest then switched to cockpit seats which were constructed to reduce the vertical height of the column of blood in the large vessels, and therefore, the hydrostatic pressure developed during angular acceleration. Late in 1944, models of the USAF Anti-G suit were captured and tested. The Germans decided that this suit did not provide enough protection from "G" effects to justify its adoption by GAF.

c. Oxygen Equipment. This subject has been covered by Col. W. Randolph Lovelace and 1st Lt. Vernon J. Wubbe in two reports which they have submitted (19) (31). A summary extracted from their reports is included herewith:

- (1) Generation of Oxygen
The production and distribution of liquid oxygen was preferred in the GAF to the production of gaseous oxygen. For this purpose, both in Germany and in the occupied countries,

liquid oxygen producing plants were operated. By this method oxygen which was 99.8% pure could be produced. The liquid oxygen was distributed to consumers by means of specially built railroad cars which carried it in the liquid form and by special trailers known as "Kesselwagens". These "Kesselwagens" were combined storage tanks and vaporizers. They were sent by road from the airfield to a generating plant or to a railroad where the liquid oxygen was poured into the Kesselwagen. While returning to the operational airfield, the oxygen began to evaporate. The oxygen servicing tanks on the airfield were then filled with gaseous oxygen directly from the Kesselwagen.

- (2) Aircraft Oxygen Systems. The oxygen systems used in the various types of aircraft were similar in lay-out and component parts. The number of bottles used and the number of outlets and regulators installed varied with the way the aircraft was used operationally and the number of crew members aboard, but the type was the same for all types of aircraft. Usually the number of regulators and oxygen outlets corresponded exactly to the number of passengers normally carried in the aircraft. If an additional passenger or observer was taken along he used a special portable bottle-regulator unit which had sufficient oxygen available to cover his needs for the whole mission.
- (3) Oxygen Bottles. Prior to about 1941, only the conventional high pressure cylindrical bottle was used in aircraft oxygen systems. When it was found that these bottles were liable to explode or to come loose from their fastenings and rocket about the airplane if they were struck by an enemy missile, the peculiar three-spheroid shaped bottle was developed and adopted. This bottle is said to be much less apt to explode than the old type and can be fastened very securely to prevent rocketing.
- (4) Regulators. Since about 1941, the GAF has employed a demand type regulator which is similar in principle and function to that used by the USAAF. As originally designed this regulator included an aneroid controlled automix feature which added air to the oxygen in inverse proportion to the altitude. Above about 25,000 feet pure oxygen was furnished. Since about 1944 the automix feature has been abandoned. This was done because oxygen conservation was not necessary since most of GAF operations were interception requiring only a few minutes in the air. To minimize the possible effects of mask leakage at extreme altitudes the "Blaser" or "Blower" was added

to the standard demand regulator. The Blaser is aneroid controlled and, above 25,000 ft. automatically releases additional pure oxygen into the mask to regulator tubing. This oxygen flows constantly whether or not the user is inspiring. Not a "pressurizing" device, the Blaser is intended to maintain pressure of oxygen in the mask constantly at ambient pressure so that nitrogen-containing outside air cannot enter the mask. It reduces the fall in pressure in the mask attendant to inspiration, thus increasing the effective altitude to which the flier can ascend before feeling the effects of anoxia, and it minimizes small leaks around the mask.

- (5) Oxygen Masks. The oxygen masks used in the GAF until the end of their operations were the so-called "non-freezing" and the "fighter" mask. The fighter mask was an older type mask which had only a single valve, an expiration valve, to permit exhaled air to be passed to the outside and to prevent the entry of the outside air into the mask. Even under the conditions of cold which were, compared to those encountered by bomber crews in the 8th Air Force, very mild, this mask tended to freeze very readily and to be useless. Consequently its use was forbidden in any except the comparatively warm fighter aircraft. The second mask, called by the Germans the "non-freezing" mask, was developed and adopted. It employs both an inspiratory and an expiratory valve. The inspiratory valve is supposed to prevent the moisture-laden exhaled air from entering the mask tubing, thus preventing the formation of ice in that tubing. As an added feature the exhaled air, which has passed through the expiratory valve, is led out around the mask-tubing for a distance of about three centimeters. It was felt that this would warm the inspired oxygen and tend to prevent freezing of the inspiratory valve. No data derived from tests of the anti-freezing features of this mask have been found.

- (6) High Altitude Bail-Out Oxygen Systems. Of great interest is the bail-out oxygen system which was developed by the GAF shortly before the end of the War in Europe. This system consists of a set of six thin tubular oxygen bottles connected in series by high pressure tubing and arranged in a flat case about one inch thick. They are connected to a single narrow gauge copper tube which acts as an oxygen flow regulator. A valve is provided which permits a continuous flow of oxygen from the bail-out system directly into the mask tubing of the user as soon as he has been disconnected from the normal aircraft oxygen system. The oxygen supply and regulator are

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a compact unit which is attached to the parachute pack in a special pouch. It requires very little space and weighs only about five pounds. In use, it is unnecessary for the flier to change, or even to disconnect, his ordinary oxygen mask before leaving the aircraft. As he bails out oxygen automatically begins to flow from the bail-out system into his mask and continues for about twenty minutes.

d. Ejectable Pilot Seat.

- (1) The introduction of jet and rocket propelled aircraft, whose speeds exceed 500 miles per hour, posed the problem of escape from such aircraft in emergencies. It was found that in climbing out of such aircraft in the usual manner, the pilot was usually thrown against the vertical stabilizer by the slip stream. To facilitate his escape, a device was created which should clear the vertical stabilizer. This device is the Ejectable Pilot Seat.
- (2) The seat is mounted in the aircraft in a track which is directed vertically from the cockpit. A piston about 3 feet in length drives the seat along the track and out of the cockpit.
- (3) At first compressed air was used as the motive force to operate the piston. Later, black powder was accepted for this purpose because it was found to be more certain in its action and to produce its force more rapidly than did compressed air.
- (4) The seat is operated as follows: first, the canopy is jettisoned; second, the pilot disconnects his microphone and oxygen mask; third, he pulls the lever igniting the black powder and is thrown clear of the aircraft; fourth, the pilot releases his safety harness and falls free of the seat. Finally, he opens his parachute (19).

e. Ribbon Parachute.

- (1) German studies of the aerodynamics of parachutes revealed that wind currents striking a descending parachute from an oblique angle lead to negative pressure on one side of the canopy similar to those on the upper surface of an airplane wing. This causes the parachute to pendulate. Prof. Madelung of Stuttgart constructed a parachute which was very permeable to wind, and which tended to break up the flow of wind currents around the canopy. This in turn prevented the formation of negative pressure on one side of the canopy with its resultant pendulating.

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- (2) The ribbon parachute is constructed of ribbons of silk or nylon, two inches wide, which are interwoven with cord to form a net. The slits between these ribbons are made wide enough to prevent pendulation, but narrow enough to offer sufficient resistance to the air to reduce the rate of fall to safe levels.

15. NUTRITION.

a. Garrison Rations.

- (1) The garrison rations of both flying and other GAF personnel has been studied by Major Paul H. Weswig, Nutrition Officer, Office of the Surgeon, US Strategic Air Forces in Europe, and compared with the US Army ration. An extract from his analysis as set forth in a memorandum is quoted below:

"Proximate Nutritional Analysis GAF Ration Scale No. 1 for Flying Personnel as Described in "Disarmament Equipment Memorandum No. 7"

Nutrient	Unit	GAF Ration Scale I	GAF Ration Scale I plus 1 kilo potatoes per day.	US Army Field Ration "A"
Energy	Calories	2720	3440	4030
Protein	Grams	87	124	133
Fat	"	91	92	173
Carbohydrate	"	389	549	485
Calcium	"	0.31	0.39	1.02
Phosphorus	Mgm	1518	1925	-
Iron	"	14	20	27
Vitamin "A"	I.U.	925	1225	6715
Thiamine	Mgm	1.64	2.54	2.87
Riboflavin	"	0.81	1.11	2.88
Niacin	"	5.6	15.7	30
Ascorbic Acid	"	-	109	119

(2) Comments concerning the nutritional analysis:

- (a) The GAF ration supplies energy in quantities sufficient for moderate activity. Approximately 50% of the energy was obtained from bread alone. The GAF issue of bread is over three times that of Field Ration "A".
- (b) While the protein requirement of the GAF fulfills the recommended standard of the National Research Council of 70 grams per day, it is to be noted that only about 20% came from animal sources. Ordinarily the quantity of animal protein in a diet is a good index to the palatability and acceptability of a ration to the troops.

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This ration is far below the American ration in this respect.

- (c) The quantity of fat in the GAF ration is sufficient to meet any physical requirements.
 - (d) The iron content of the GAF ration is above recommended standards. They probably receive as much iron from their cooking vessels as they do from the ration.
 - (e) The calcium content of the GAF ration is about one-half recommended standard. Possibly some of the German personnel were able to supplement the ration with fresh milk although there was no milk listed in the ration scale.
 - (f) The vitamin "A" content of the GAF ration is extremely low as calculated. This calculated estimate is probably too low, for undoubtedly their ration contained carrots, greens such as turnip or kale, etc. which would increase the carotene content of the ration. There is the possibility that the ration is supplemented with vitamin capsules.
 - (g) Another vitamin which is below even borderline standards is riboflavin. The calculated value of this vitamin should be quite accurate as the main classes of foods which contribute significant quantities of this vitamin to the ration are strictly rationed. Again this deficiency may be alleviated with vitamin supplements.
 - (h) The ascorbic acid content of the ration is calculated to be ample. However, all of this vitamin as calculated was derived from potatoes. As potatoes lose about 60 to 80% of this vitamin on storage, the GAF ration would have considerably less total available ascorbic acid in the spring of the year. The National Research Council recommended standard of 75 mg per day of this vitamin for optimum health. Many people have subsisted on quantities of this vitamin far below this standard without showing symptoms of avitaminosis C (e.g. the British ration).
- (3) Comment concerning the components of the ration scale.
- (a) In the GAF, flying personnel on combat, transport or courier receive the best ration authorized. It differs from the other scales of GAF rations in that it contains the most meat, spreads (fats) and sugar. These items are usually considered to be the most desirable part of the ration.

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- (b) The following table lists the components of the GAF ration scale No.1 in contrast with Field Ration "A".

Comparison of GAF Ration Scale No.1 with Similar Components of Field Ration "A" as Issued in March, 1945.

Ration Component	Field Ration "A" March 1945.	GAF Ration Scale No.1
	Grams/day	
Meat, fresh (carcass)	330/(1)	143
Butter	32	51 (2)
Other fats	15	2
Jam	25	19
Sugar	125	40
Flour	68	7 (Soyb)
Bread	80	700

- (1) Conversion factor boneless to carcass meat is 1.4
- (2) Issued as "spread". May or may not be butter.
- (c) Field Ration "A" supplies considerably more meat, sugars and flour, while the GAF ration furnished over three time as much bread. There is very little difference in the total fat issued. However, most of the fat in the GAF ration is defined as "spread" and is undoubtedly used as such on the large quantity of bread issued. Only two grams per day are specified for cooking purposes. Boiling must be their main method of preparing food.
- (d) The GAF has four scales of ration with No.1 being the best. In the other scales there are proportionate reductions in each scale of fresh meat, "spreads" and sugar. For instance, ration Scale IV provides less than one pound of meat per week and about half as much "spread" as allowed in ration Scale I.
- (e) The sick and wounded in hospitals are provided with ration Scale No.1 or No.III depending on location. The best ration is provided for those farthest from home territory.

b. In Flight Meals. Due to the nature of GAF operations, which were predominately short-time fighter sweeps, the need for in-flight meals was not great and little work was done on the subject. Those large airplanes making long flights over the Atlantic used only the "Iron Ration" (Eisenration) or sandwiches and hot coffee in thermos bottles. Air crews were advised

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to take candy with them to combat cold, fatigue and latent anoxia, but no special high-dextrose or other diet was furnished for this purpose.

c. Emergency Rations. The nature of the GAF operations in the latter part of the war, once more, made the development of emergency rations to be consumed while lost in the desert or while awaiting rescue at sea, superfluous. The few concentrates which were used are listed below:

- (1) Eisenration. This is the "Iron Ration", famous since the last war. It consists of 200 grams of pork which has been cooked and spiced. The ration is quite palatable and acceptable to the troops. This ration was taken along in the aircraft by the troops operating over the desert in Africa and also by those who were flying over water. After a crash landing or ditching, the ration was taken out of the aircraft and consumed while awaiting rescue.
- (2) Bratling's Pulver. This was a substance obtained from wood pulp as a by-product of paper manufacture. Having a high protein content it was used in the same way as a boullion cube.
- (3) Zweiback. Was also issued to furnish carbohydrates.

16. AERO MEDICAL INTELLIGENCE.

a. One of the striking features of this investigation was the lack of knowledge on the part of the Germans of American developments and research in Aviation Medicine. The very few items concerning which they seemed to have any knowledge were received from unrestricted literature such as newspapers and periodicals. Certain items such as the "G" suit and aviation medical pamphlets had been captured.

b. Japanese and German Medical Cooperation. General Rose stated that information had been sent to the Japanese concerning medical developments but that such transactions were entirely in one direction as the Japanese never reciprocated by sending any information in return. He stated that at one time the Japanese requested yellow fever vaccine virus. This was sent to them but its receipt was never acknowledged. A year later another request was made by the Japanese for the same material.

c. Relative to the progress of Japanese Aviation Medicine Prof. Strughold gave the following information. A Lt. Col. Miura had been sent to Prof. Strughold's Institute for a period of two years (1941-1942). This doctor studied all Luftwaffe Aero-Medical procedures and research. He attended all lectures given by the various leaders in Aviation Medicine regardless of how far he had to travel to do so. In 1942 at the request of the Japanese Government, Lt. Col. Miura took copies of all records and of Aviation medical research documents and left Germany by submarine. After a period of time the Japanese Government requested a duplicate set of all records and research files which had been procured by Miura. Strughold states that he believes for good reason that neither the submarine nor Miura ever arrived in Japan due to the loss of the submarine. He further states that it is his belief that Japan must be far behind Germany and

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the Allied countries in their development of Aviation Medicine and personal equipment, as Miura was the only Japanese who had made any progress in Aviation Medicine. With his loss there were no consultants in this field to aid the Japanese Air Force. He further stated that the Japanese had sent 30 Aviation Engineers to Germany but that the group contained no one interested in Aviation Medicine or personal equipment.

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B I B L I O G R A P H Y

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INSTITUTIONS VISITED

Aero-Dynamische Institut, Göttingen.

Allgemeines Krankenhaus, University of Heidelberg.

Allgemeines Krankenhaus, University of Tübingen.

Augen Klinik, Bad Nauheim.

Augen Klinik, University of Frankfurt.

Augen Klinik, University of Giessen

Augen Klinik, University of Göttingen.

Chirurgische Klinik für Hirnkrankheiten, University of Göttingen.

Entomological Institut, near Dachau.

Graf Zeppelin Institut, Stuttgart.

Herman Göring Institut, Volkenrode.

Institut für Luftfahrtmedizin, Freising.

J. V. Zeuzem (Engineering Firm), Frankfurt.

Kaiser Wilhelm Institut, Heidelberg.

Kaiser Wilhelm Institut für Psychiatry, Munich.

Kerckhoff Institut, Bad Nauheim.

Luftfahrtmedizinische Forschungs Institut, Garmisch-Parten-
kirchen.

Luftfahrtmedizinische Forschungs Institut des Reichsluftfahrt-
ministerium, Brannenburg am Inn,

Luftwaffe Lazarett, Brunswick,

Luftwaffe Lazarett, Halle-Döhlau.

Luftwaffe Lazarett, Ober-Fähring near Munich.

Luftwaffe Lazarett, Possenhofen on Starnberger See.

Luftwaffe Sonder Lazarett for Brain Injuries, Bad Ischl,
Austria.

Nevern Klinik, University of Frankfurt.

Nevern Klinik, University of Göttingen.

Nevern Klinik, University of Jena.

Nevern Klinik, University of Munich.

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Neven Klinik, University of Würzburg.
Chren Klinik, University of Frankfurt.
Ohren Klinik, University of Göttingen.
Pharm kologisches Institut, University of Innsbruck.
Physiologisches Institut, University of Göttingen.
Physiologisches Institut, University of Munich.
Physiologisches Institut, University of Tübingen.
Psychologisches Institut, University of Göttingen.
Psychologisches Institut, University of Heidelberg.
Psychologisches Institut, University of Jena.
Psychologisches Institut, University of Munich.
Zeiss Optical Company, Jena.

PERSONS INTERVIEWED.

Achelis, Prof. Dr. J.D. Prof. of Physiology, Univ. of Heidelberg.
Allesch, Prof. Dr. G.V. Psychologist, Univ. of Göttingen.
Amelunxen, Oberstabsarzt Dr. Ernest von. Neuropsychiatrist, Luftwaffe Lazarett Ober-Führung near Munich.
Attwenger, Oberarzt Dr. Hans. Assistant Dir. of Surgery, Univ. of Heidelberg Hospital.
Becker-Freyseng, Stabsarzt Dr. M. Coordinator of Aviation Medical Research, Office of Surgeon General of the GAF.
Bensinger, Dr. Theodor. Medical Research Installation, Erprobungsstelle der Luftwaffe, Rechlin.
Bingel, Stabsarzt Dr. Adolf. Neuropsychiatrist, leader of the Sichtungsstelle and Untersuchungsstelle, Oslo, Norway.
Busenmann, Dr. A. Research Staff, Herman Göring Institut, Volkenrode.
Buttner, Dr. Konrad. Biophysicist, Univ. of Tübingen.
Cibis, Prof. Dr. Paul. Ophthalmologist, Eye Clinic, Univ. of Heidelberg.
Dach, Dr. D. Psychologist, Kronberg near Frankfurt.
Dessaga, Dr. Hans. Helmholtz Research Institut, Brannenburg am Inn.

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Ehrenstein, Prof. Dr. W. Psychologist, Kerckhoff Institute,
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Frenzel, Prof. Dr. H. Prof. of Otolaryngology, Univ. of
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Gauer, Dr. Werner. Asst. Prof. of Physiology, Univ. of
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Heinrich, Dr. Hug. Helmut. Research Staff, Graf Zeppelin
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Hellpack, Prof. Dr. W. Psychologist, Univ. of Heidelberg.

Henschke, Prof. Dr. U. Director of the Medical Research
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Herwig, Prof. Dr. B. Psychologist, Brunswick.

Hollwich, Stabsarzt Dr. Fritz. Ophthalmologist, Luftwaffe
Lazarett, Ober-Föhring.

Jarisch, Prof. Adolph. Prof. of Pharmacology, Univ. of
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Keidel, Dr. Wolf-Dieter. Medical Research Institute,
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Knacke, Dr. Theodor. Research Staff, Graf Zeppelin Institute.

Knothe, Dr. Werner. Chief of Research, Medical Research and
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Koch, Prof. Eberhard. Physiologist, Univ. of Giessen.

Kornmüller Stabsarzt Dr. A.E. Research Staff, Kaiser Wilhelm
Institute for Brain Research, Berlin-Buch.

Krant, Dr. Heinrich. Biochemist, Kaiser Wilhelm Institute
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Krause, Ob.Reg.Rat. Dr. Karl. Psychologist, Göttingen.

Kretschmer, Oberfeldarzt Prof. Dr. Ernst. Neuropsychiatrist,
Univ. of Marburg.

Kroeber-Kenneth, Dr. L. Psychologist, Messerschmitt Co.,
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Kyricleis Prof. A. Prof. of Ophthalmology, Univ. of Giessen.

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Leinung, Oberstabsarzt Dr. Dir. of Administration Office of the Surgeon General of the GAF.

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Lutz, Stabsarzt Dr. Wolfgang. Research Staff, Aviation Medical Research Institute, Freising.

Luxemburger, Oberstarzt Prof. Dr. Hans. Consultant for Psychiatry to the Surgeon General of the GAF.

Matthes, Dr. M. Dept. of Internal Medicine, Univ. of Leipzig.

Metzge, Dr. Erwin. Psychologist, Heidelberg.

Middendorf, Dr. H. Psychologist, Munich.

Mueller, Dr. M.A. Psychologist, Kaiser Wilhelm Institute, Dortmund.

Rein, Prof. Friedrich H. Prof. of Physiology, Univ. of Göttingen.

Roeder, Stabsarzt Dr. Fritz. Kaiser Wilhelm Institute for Research in Neuropsychiatry, Munich.

Rose, G. Generalarzt. Chief of Preventive and Tropical Medicine, Office of the Surgeon General of the GAF.

Rose, Dr. H. Research Staff, Eye Clinic, Univ. of Göttingen.

Ruff, Dr. S. Director of the Aviation Medicine Institute, German Research Center for Aviation, Berlin.

Sander, Prof. Dr. F. Psychological Institute, Univ. of Jena.

Schaeffer, Dr. Hans. Director of the Kerckhoff Institute, Bad Nauheim.

Schneider, Oberstarzt Prof. Dr. Kurt. Director of the Kaiser Wilhelm Institute for Psychiatry, Munich.

Schoen, Dr. Rudolph. Chief of Medicine, Univ. of Göttingen.

Schroeder, Generaloberstabsarzt. Surgeon General of the German Air Force.

Seiffert M. Prof. Prof. Otolaryngology, Ear Clinic, Univ. Heidelberg.

Spatz, Stabsarzt Prof. Dr. Hugo. Brain Pathologist, Kaiser Wilhelm Institute for Brain Research, Berlin.

Stürming, Stabsarzt Dr. Gustav. Neuropsychiatrist, Luftwaffe Lazarett, Paris-Clichy.

Strughold, Oberstarzt Prof. Dr. H. Director of the Aviation Medicine Research Institute of the Reichsluftfahrt-Ministerium, Berlin.

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Taggeselle, Oberstabsarzt Ernst. Commanding Officer of the
Halle-Döhlau Hospital of the G.F.

Tönnis, Oberfeldarzt Prof. Dr. W. Consultant for Neuro-
Surgery to the Surgeon General of the G.F.

Vetter, Dr. August. Psychologist, German Institute for
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Voigt, Dr. H. Psychologist, Univ. of Jena.

Villinger, Stabsarzt Dr. Walter, Chief of Sichtungsstelle,
Luftwaffe Lazarett, Ober-Föhring.

Wagner, Dr. J. Psychologist, Univ. of Frankfurt.

Wecker, Oberfeldarzt Dr. H. Luftwaffe Erholungsheim, Kitzbühl.

Wurz, Dr. R.V. Staff Member, Aviation Medicine Research
Institute, Freising.

Woltz, Oberfeldarzt Prof. G.A. Chief of Aviation Medicine
Institute, Munich.

Witte, Dr. W. Psychologist, Univ. of Heidelberg.

Zeise, Dr. L. Psychologist, Munich.

S E C R E T

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REFERENCES.

1. A.D.I.(K) Report No.346/1945. The G/F Medical Services I. (In German).
2. A.D.I.(K) Report No.347/1945. The G/F Medical Services II. (In German).
3. Acro-Medical Section, Office of the Surgeon, USSTAF (Rear). Preliminary Report of Interrogation of Certain High Staff Officers of the Luftwaffe Medical Services. 16 July 1945.
4. A.I.12 Y/21 Report. Organization of the G/F Medical Services. (In German).
5. A.I.12 Y/21A Report. G/F Dental Services. (In German)
6. A.I.12 Y/21B. G/F Medical Reports. (In German).
7. Alexander, Maj. Leo. Treatment of shock from Prolonged Exposure to Cold, Especially in Water. C.I.O.S. Black List Item No.24, Medical.
8. Arztliches, Bericht und Meldewesen der Luftwaffe im Kriege D (Luft) 2301.
9. Anweisung für den Zahnärztlichen Dienst der Luftwaffe im Kriege.
10. Directions for the Selection of Flying Personnel. Published by the Oberkommando der Luftwaffe. May 1943. (English translation).
11. Directive for the Field Medical Officer. Prevention of Suicide. Issued by the Surgeon General of the G/F. May 1941. (Republished Oct. 1942). (In German).
12. Directive for the Field Medical Officer. Special Medical Installations for Flying Personnel. Issued by the Surgeon General of the G/F. Nov. 1943. (In German).
13. Directive for the Field Medical Officer. The Evaluation of Homosexual Acts. Issued by the Surgeon General of the G/F. June 1944. (In German)
14. Directive for the Field Medical Officer. Einzelanordnungen No.11. Issued by the Surgeon General of the G/F. Dec. 1944. (In German).
15. Driest, Oberstabsarzt Dr. W. Military Mental Hygiene. (In German).
16. Ehrenstein Prof. Dr. Walter F. Die Optischen Täuschungen als Kriterium der Ermüdung. Industrielle Psychotechnik. 1943/44. Heft 1/3, Seite 18 - 20.
17. Gerathewohl, Dr. S. Das Personalbeurteilungswesen der Luftwaffe.

S E C R E T

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18. Kornmüller, Dr. A.E.. Clinical Electroencephalography.
1944. (In German).
19. Lovelace, Col. W. Randolph and Wulff, Lt. Vernon. Evalu-
ation of Targets Investigated and Summary of Informa-
tion Obtained Pertaining to Research in Aviation
Medicine for the German Air Force. July 1945.
20. Luxemburger, Oberfeldarzt Prof. Dr. Hans. Instructions
for Writing Psychiatric Reports for Military Courts.
1943. (In German).
21. Medical Research Institute, Garnisch-Partenkirchen. File
of Research Reports.
22. Regulation of the Medical Examination for Flying Duty,
L.Dv. 94 (In German).
23. Report of Meeting of Luftwaffe Pathologists in Freiburg,
March 1942. Brain Injury. Mitteilungen aus dem
Gebiet der Luftfahrtmedizin, published by the Surgeon
General of the GAF. 1942 (In German).
24. Research Report No. 18/43 from the Luftwaffe Kurlazarett,
Oberschreiberhau. Fatigue Conditions in Flyers.
Mitteilungen aus dem Gebiet der Luftfahrtmedizin,
published by the Surgeon General of the G.F. 1941
(In German).
25. Rose, H.W. and Schmidt, I. Influencing Dark Adaptation.
26. Sammelheft: Markblätter für den Sanitäts Dienst. H.Dv. 209;
M.Dv. 284; L.Dv. 800.
27. Schreuder, Col. Otis B.; Ball, Col. George; Campbell,
Col. Paul A.; Fitts, Lt. Col. Paul H.; Sweeney, Maj.
William F.; Van der Heide, Capt. Carol. Assembled
Interrogation Reports. Aeronautical Section, Office
of the Surgeon, USSTF (REAR).
28. Strughold, Prof. Dr. H. Speed in War and Physiological
Latent Periods.
29. Tünnis, Oberfeldarzt, Prof. Dr. W. Directions for the
Treatment of bullet wounds of the Brain and the Evalu-
ation of the Residual Condition. 1942. (In German).
30. Wehrpsychologische Mitteilungen. Inspection für Eignungs-
untersuchungen (OKH). Berlin NW 7. Published 1939
thru 1942. (In German).
31. Wulff, Lt. Vernon J. Report of Investigation of Targets
Pertaining to Aviation Medicine.
32. Vorschrift über Militärärztliche Untersuchungen der
Wehrmacht. H.Dv. 25201, M.Dv. 248-1, L.Dv. 399-1.

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A P P E N D I C E S

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APPENDIX I

HISTORY OF DEVELOPMENT OF THE G.F
MEDICAL SERVICES

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HISTORY OF DEVELOPMENT OF THE

AIR MEDICAL SERVICES

Ober Kommando der Luftwaffe
Genst. Gen. Qu/Chef des Sanitätswesens

29.7.1945.

Subject: Sanitätswesen der Luftwaffe.

TO : O.K.L. Control Party.

In 1933 when the GAF was being formed, the medical service was under the Surgeon General of the Army. In the Ministerium for Air, a medical department was organized under a colonel as "head of the department". In professional matters the Surgeon General of the Army was his superior and in all others he reported to the Chief of the General Staff of the GAF. As the GAF grew larger, the professional command-relation with the Surgeon General was resolved. The medical department became "Medical Inspektion" (abbreviated L.In. 14) and the head of the Medical department became Inspector of the Medical Service. At this time the Medical Inspectorate came under the command jurisdiction of the "Generalinspekteur" of the GAF, as did other Inspectorates which were organized at the same time, such as fighter and bomber pilot commands, anti-aircraft and communications. This command relation changed during the war at the time that the office of the Chief of the Luftwaffe was made independent of the Generalinspekteur and given command over several Inspectorates including L. In. 14. The command relation changed again when the various Inspectorates mentioned above became organizations headed by Generals under the Chief of the General Staff, and on 1st April 1944 the Inspectorate of the Medical Service became "Chef des Sanitätswesens der Luftwaffe" under command jurisdiction of the Quartermaster General.

At the time of the establishment of L.In.14 the table of organization was as I have drawn it from memory in a chart.

When War broke out, six consultant specialists and in addition the medical staff of the Inspectorate for Air Defense (L.In.13) were assigned to L.In.14. During the war the table of organization needed to be enlarged as the field of work extended. The gaps in the chain of command were closed first; later on, positions which thus had been created were fitted in with the plan of organization of 1943. In it, all divisions are represented in a way commensurate with the extent and the task of the Medical Service. There was no curtailment because of the war. Therefore, one may consider this table of organization rightly as a product of war experience; it is complete and has been prepared most thoroughly.

The further development of the war necessitated economies in certain fields. All work which was not essential to the war effort had to be discontinued. The numerical strength of all staffs was reduced continuously so as to free officers and men for service with the troops. The various reductions made for this reason produced the organizational chart of 1945. The sections-reports and statistics were eliminated. That department was intended to collect documents and to work them out after the war. Other sections were strongly curtailed as the Surgeon General was able to take over some parts of them and simply reduce others. The total of work became smaller when the fronts drew shorter. Further economy was achieved by having one medical officer cover both a section and a sub-section. It will be noted that the six consultant specialists to the Surgeon General of the GAF are no longer on the organizational chart of 1945. This does not mean that they fell victim to the economy. Together with former consultant specialists of the commands, they are entered as a special group "Science and Research" in the Medical Academy of the GAF. The

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"Science and Research group" and its consultant specialists and advising specialists (who were called in for extraordinary projects) formed a scientific advisory body to the Surgeon General of the G.F. Moreover the Academy had three teaching groups for students and an "Institute for Military Hygiene" which was in the process of being built up. Detailed information about the training and positions of medical officers has been presented on a separate sheet.

The scientific institutes together with their special field of work, leaders and co-workers are listed on another page.

The chain of command and its relations in the Medical Service also has been drawn up. In the Medical Service a differentiation should be made between the ordinary and professional medical chain. All purely military matters follow the former, all medical matters the latter. The medical officer can be simultaneously a unit and a professional commander; for instance he can be the leader of a medical company, senior officer of a lazarett, and commandant of an ambulance group. Or, if he has no medical detachment under his command, he would only be the professional commanding officer, for instance as Luftlotte physician. This arrangement determined the channels through which a question which could not be settled at the lower echelon was preferred for decision. A purely medical question of prevention of disease would for instance pass from the local medical officer to the next higher medical officer, for instance from the Luftgau medical officer to the medical officer with the Luftlotte to the Surgeon General of the G.F. A purely military matter, for example, armistice, billeting, or a report on vehicles of the unit, goes from the leader of the medical unit to the next higher commanding officer. In matters of personnel this can be the Luftgau medical officer, who could be both ordinary and professional commander. If he cannot decide he consults the next higher echelon, in this case the Luftgau. The details can be seen in the chart.

Signed Professor Schröder

(Appendices removed)

For complete report see :

Report USSTAF (Rear) Medical Services of the G.F. dated 12 July 1945.



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APPENDIX II

ORGANIZATION CHART OF THE G F.

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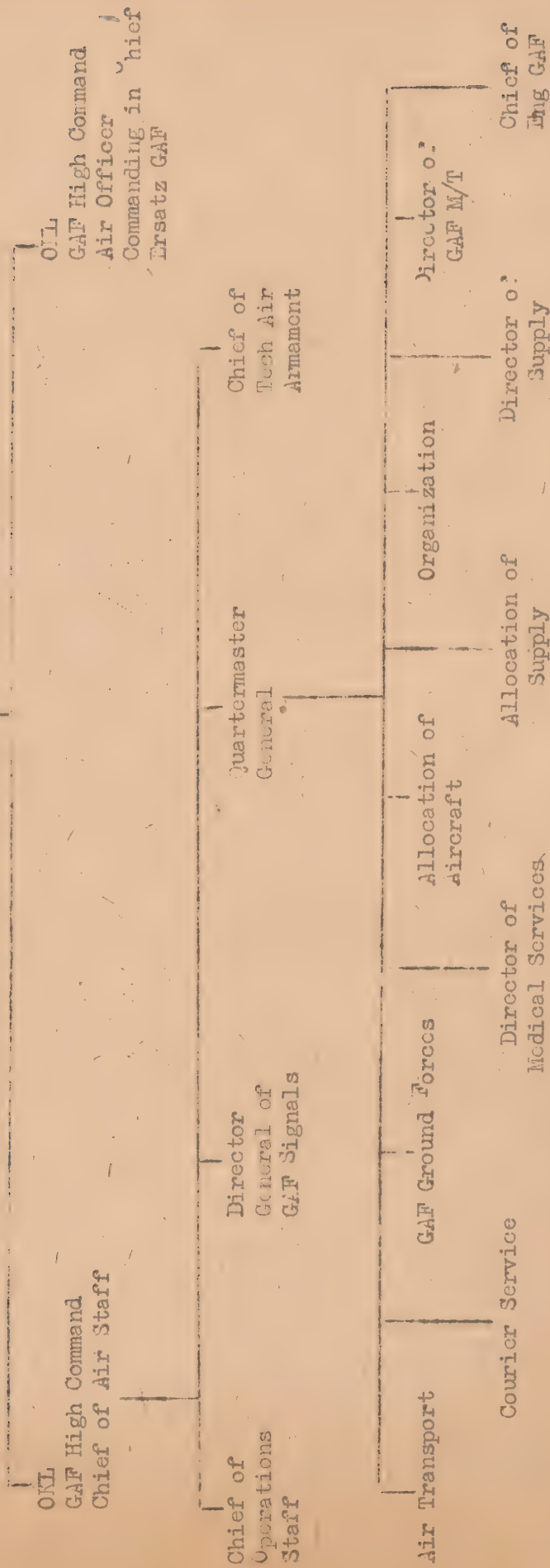


江

(Abbreviated)

SUPREME COURT OF CALIF.

Reichminister for Air





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APPENDIX III

ORGANIZATIONAL AND FUNCTIONAL CHART:

SURGEON GENERAL OF THE G.F.

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APPENDIX IV

CHART OF MEDICAL COMMAND SHOWING
CORRESPONDING OPERATIONAL LEVELS

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CHAIN OF MEDICAL COMMAND SHOWING CORRESPONDENCE

OPERATIONAL LEVELS



(Extracted from A.D.I. (K) Report No. 346/1945)

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APPENDIX V

GRAPHS SHOWING INCIDENCE OF DISEASES
IN THE IRT

- a. Wechselfieber (Malaria).
- b. Fleckfieber (Typhus).
- c. Typhus und Paratyphöse Erkrankungen (Typhoid and Paratyphoid Fever).
- d. Ruhr (Bazillen-Pseudo-Ruhr) (Bacillary Dysentery).
- e. Darmkatarrh und Magendarmkatarrh (Gastro-enteritis).
- f. Tuberkulose d. Atmungsorgane u.d. Brustfells (Pulmonary and Pleural Tuberculosis).
- g. Syphilis.
- h. Tripper (Gonorrhea).
- i. Diphtherie.
- j. Scharlach (Scarlet Fever)
- k. Erkrankungen der Haut (Skin Diseases).

Note: The figures shown in these charts may be misleading as the entries for the figure "one" appear very similar to entries for the figure "seven". The seven may be identified by the crossed line similar to a capital "F".

S E C R E T



Wechselfieber (Malaria)

1939

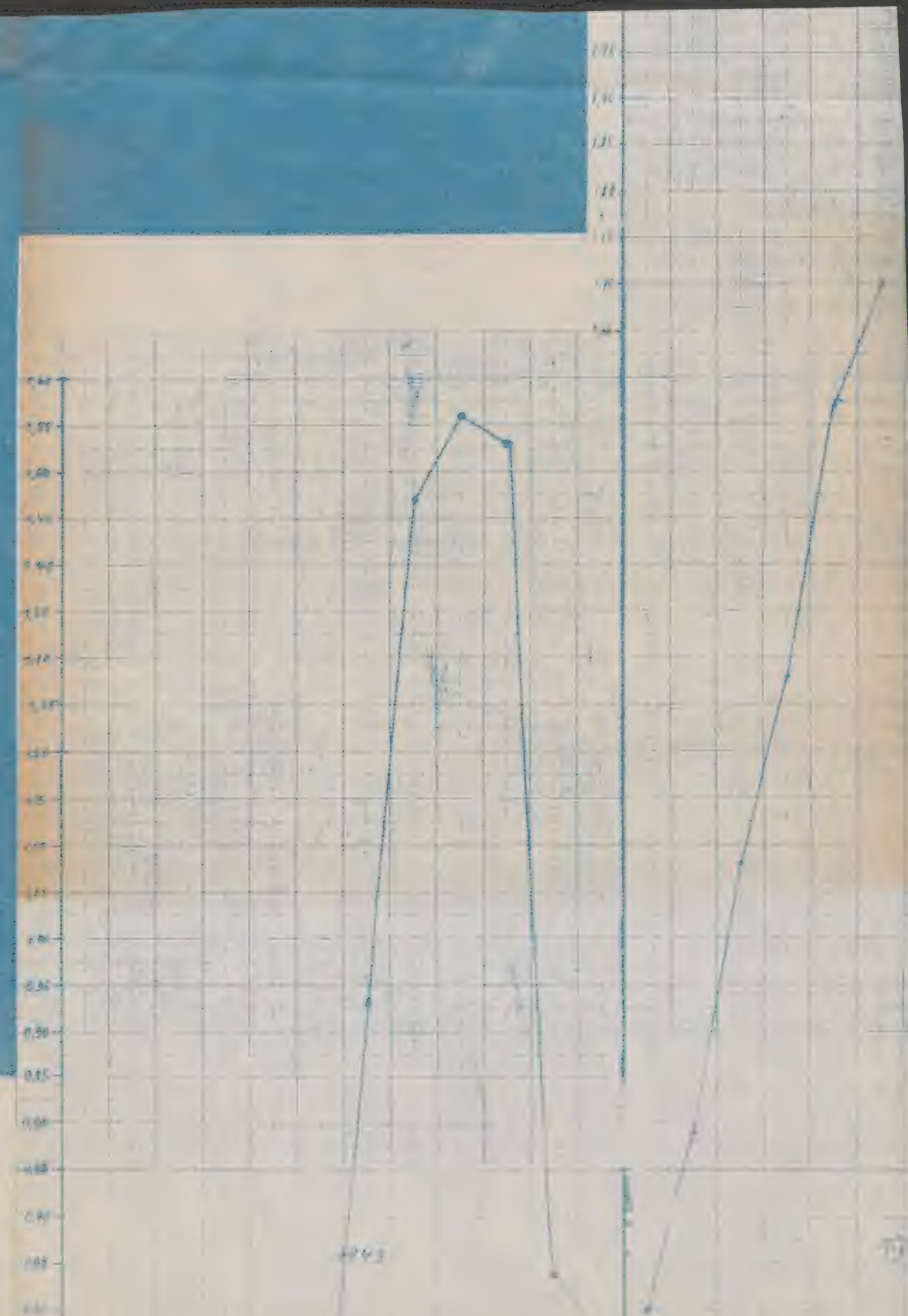
1940

1941

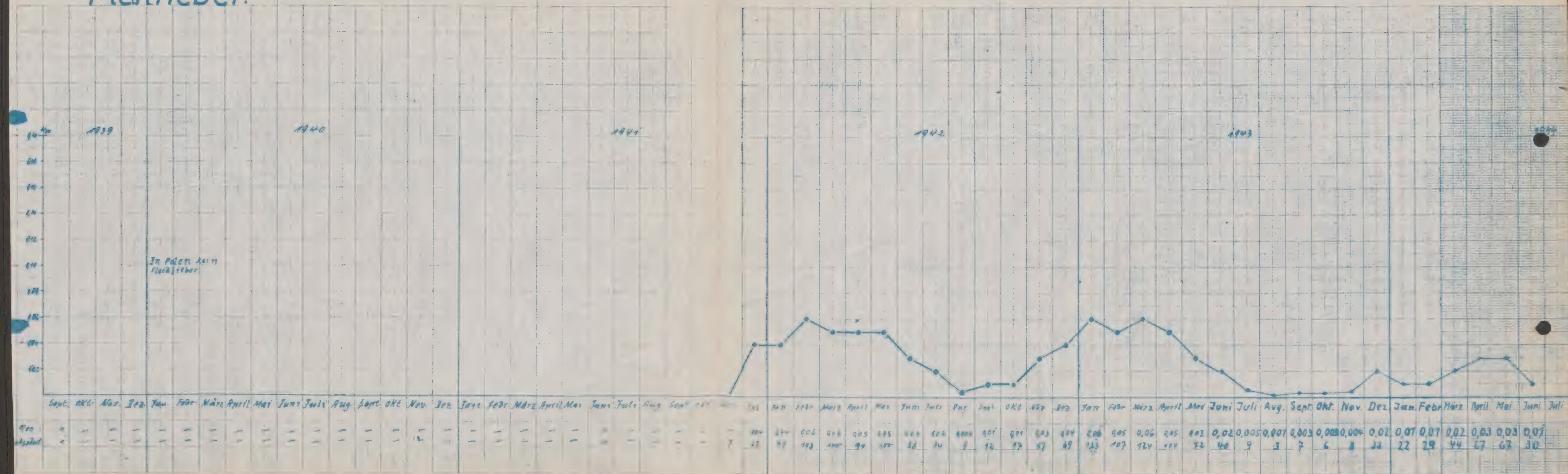
1942

1943

1944

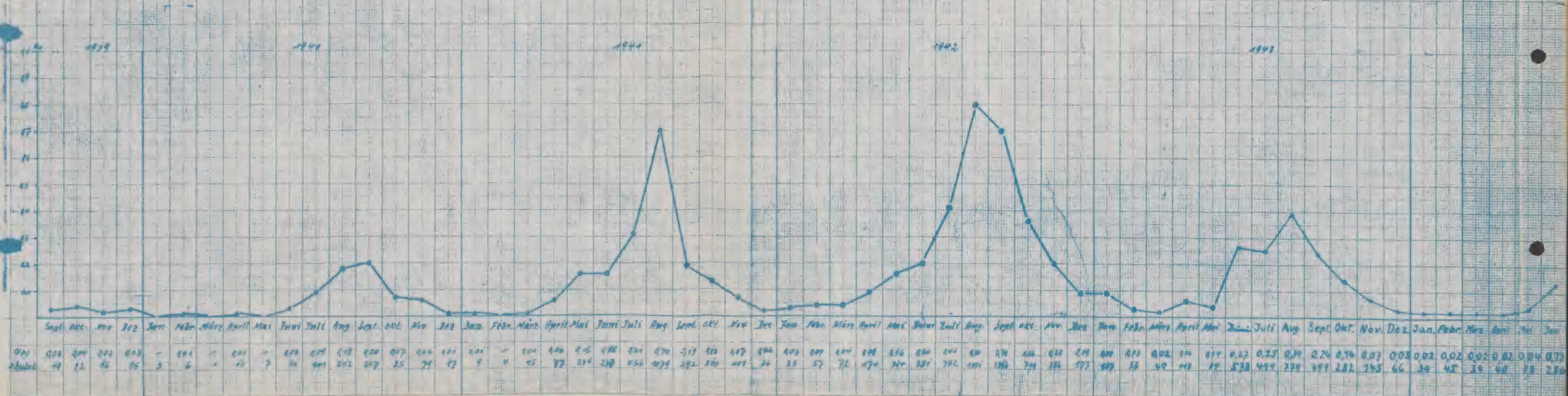


Fleckfieber.

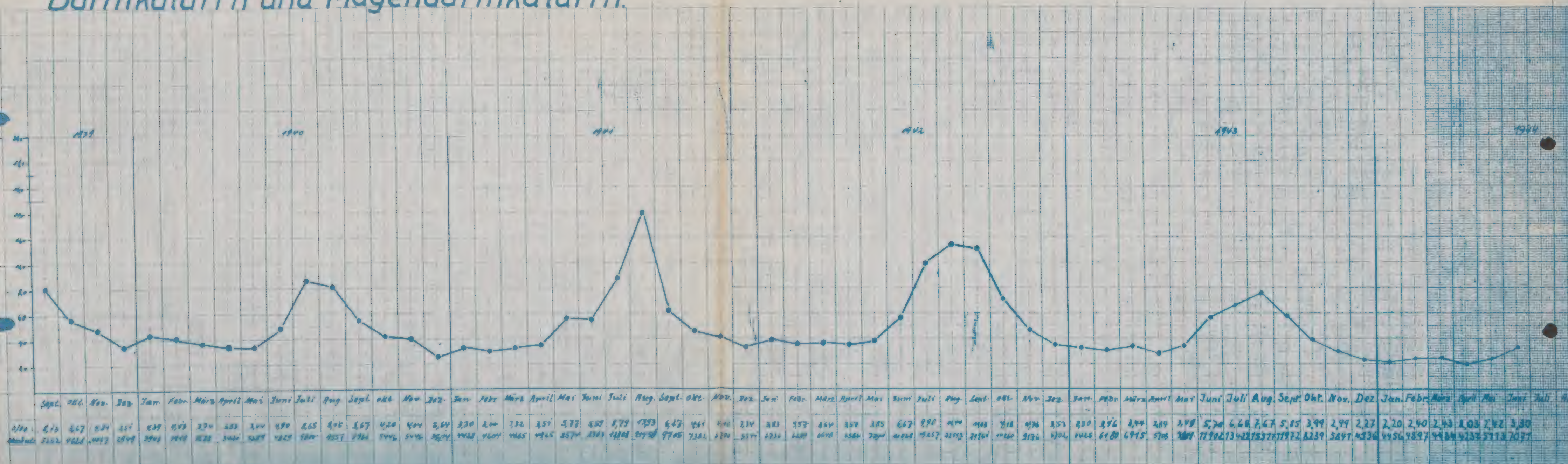


Typhus und paratyphöse Erkrankungen

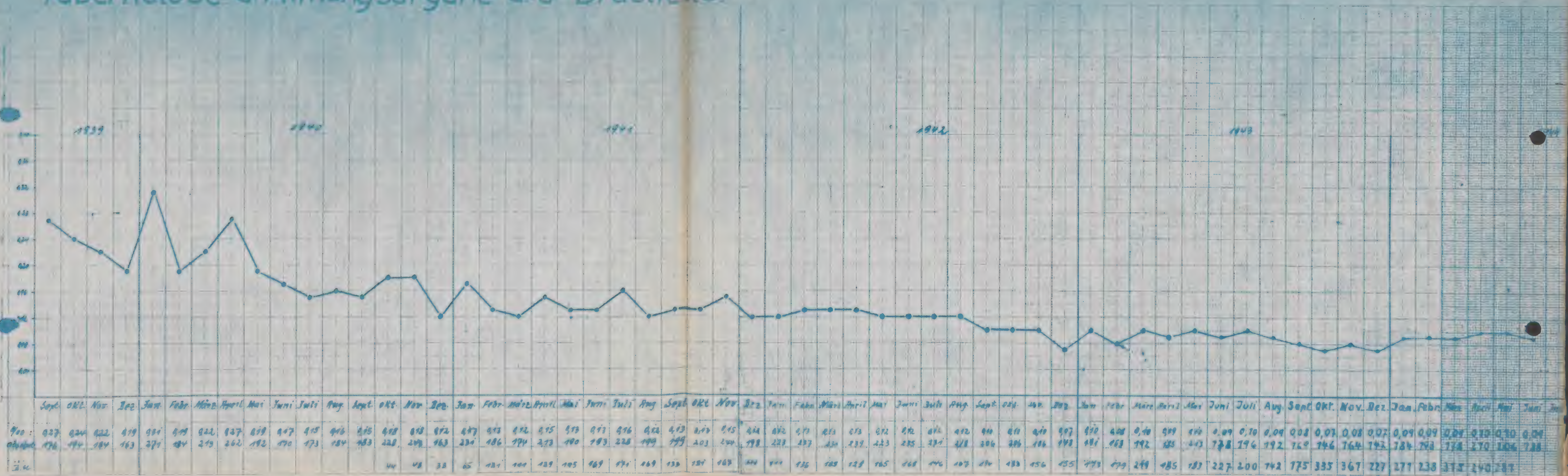
Ruhr (Bazillen-Pseudo-Ruhr)



Darmkatarrh und Magendarmkatarrh.



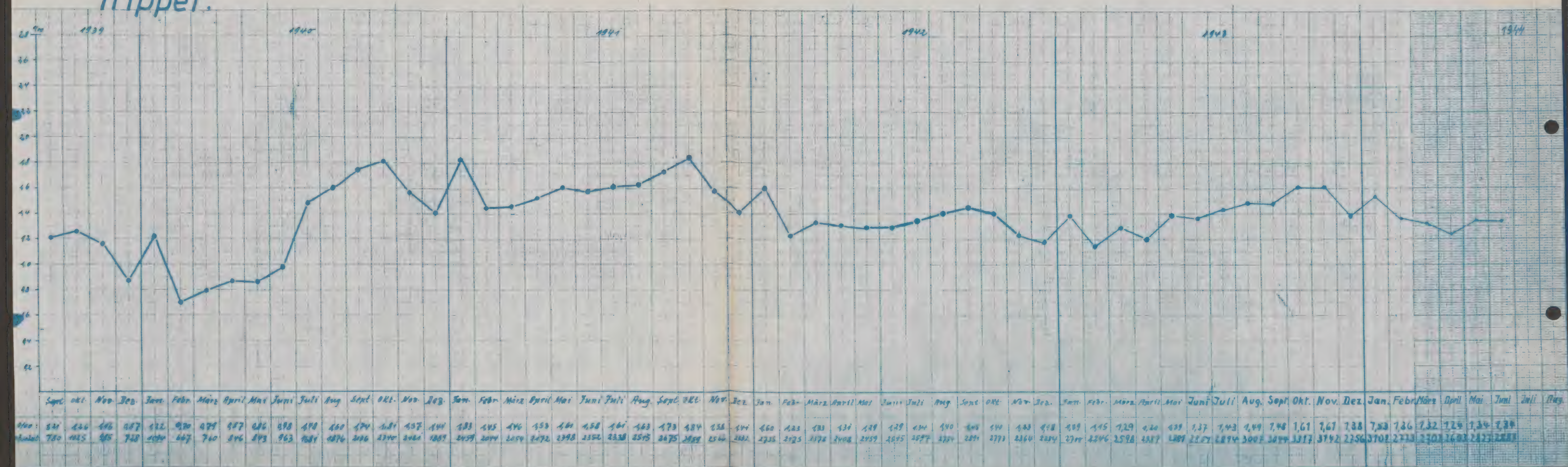
Tuberkulose d. Atmungsorgane u. d. Brustfells.



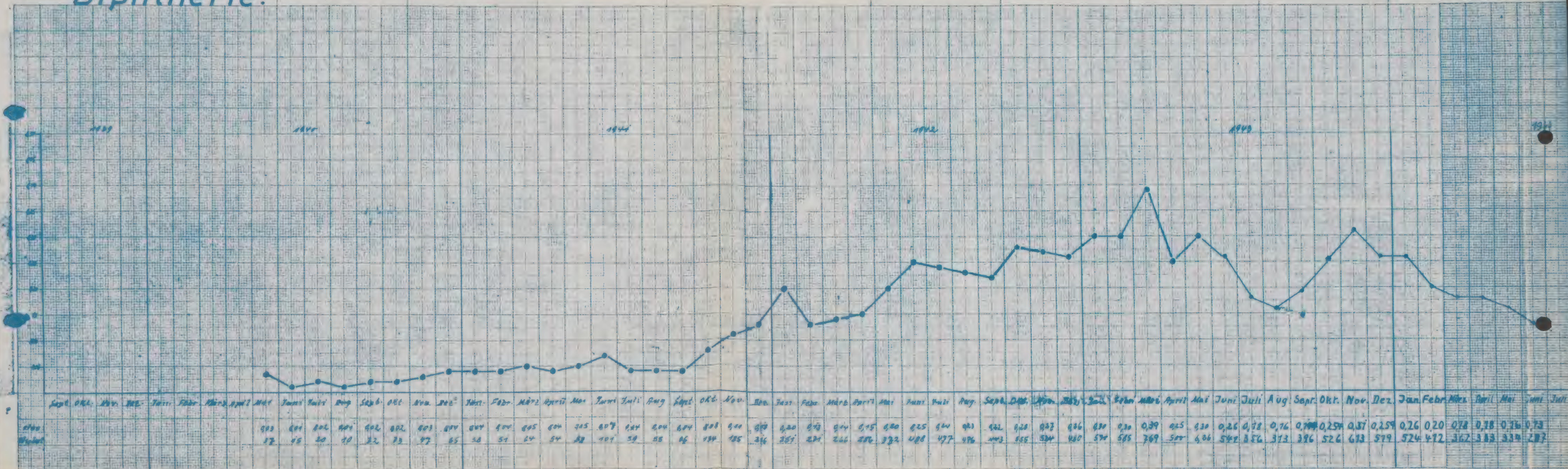
[illegible]

	Sept	OKt.	Nov.	Dec.	Jan.	Febr.	März	April	Mai	Juni	Juli	Aug.	Sept.	OKt.	Nov.	Dec.	Jan.	Febr.	März	April	Mai	Juni	Juli	Aug.	Sept.	OKt.	Nov.	Dec.	Jan.	Febr.	März	April	Mai	Juni	Juli	Aug.	Sept.	OKt.	Nov.	Dec.	Jan.	Febr.	März	April	Mai	Juni	Juli	Aug.										
Nov.	906	903	909	905	909	909	909	910	909	908	910	910	910	910	910	910	915	913	917	917	920	926	922	923	928	927	927	928	928	930	930	935	942	944	946	942	943	939	944	939	943	950	950	947	947	943	947	938	940	939								
Wiederf.	41	58	78	39	79	88	90	106	18	89	103	125	134	103	152	138	281	218	172	219	219	290	375	139	261	454	405	756	503	475	530	760	478	565	582	596	609	623	577	663	811	877	923	816	883	827	884	784	872	1026	923	870	928	887	847	801	847	839

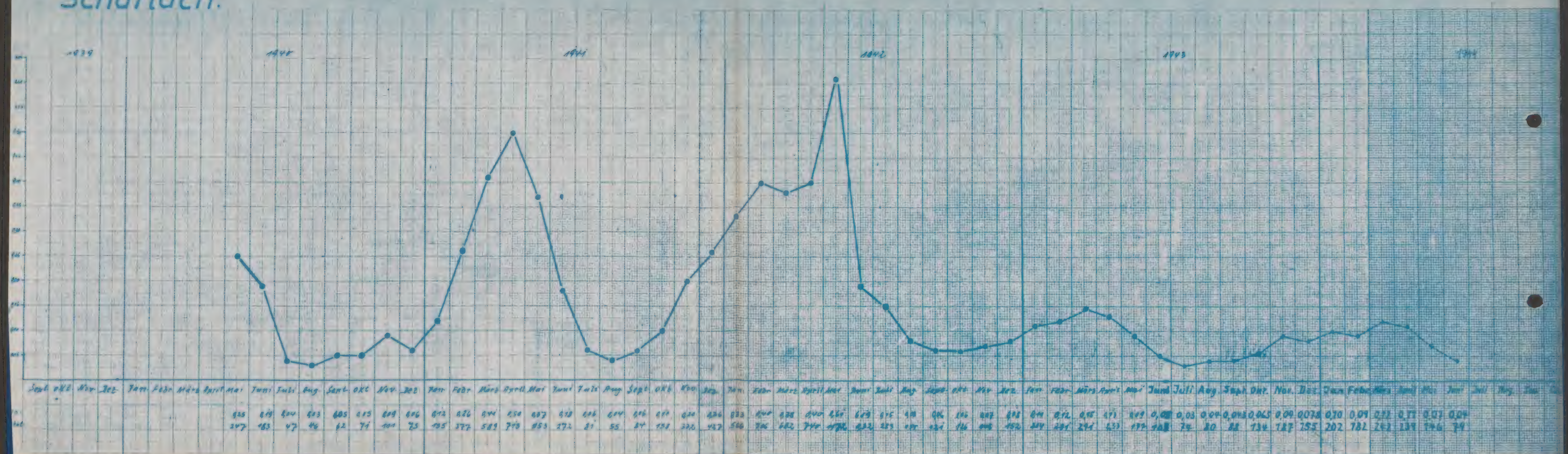
Trippe.



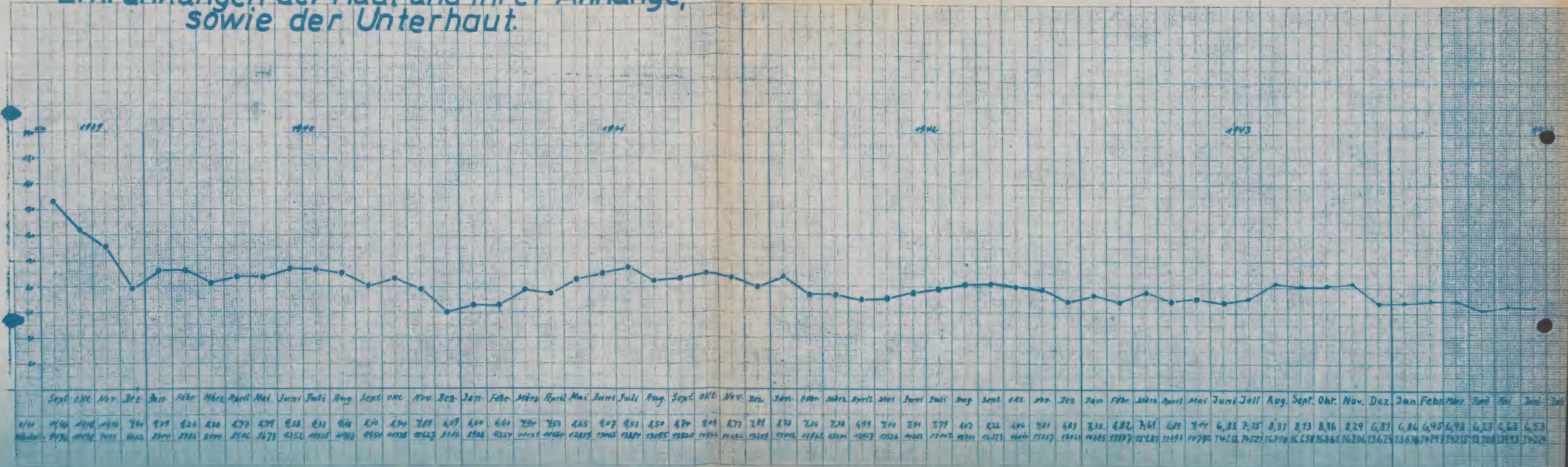
Diphtherie.



Scharlach.



Erkrankungen der Haut und ihrer Anhänge,
sowie der Unterhaut.



S E C R E T

APPENDIX VI

PHYSICAL EXAMINATION RECORD

S E C R E T



Vor der Bearbeitung ist der gesamte Fragebogen, der die Vorgeschichte umfaßt, von dem zu Untersuchenden durchzulesen.

Vorgeschichte

Dahrend

Von dem zu Untersuchenden auszufüllen und vom Seeauswärtler mit ihm durchzusprechen und gegebenenfalls zu ergänzen.

Demerkung für den zu Untersuchenden: Wer über die Vorgeschichte wissentlich oder grobfahrlässig falsche, unvollkommene oder zur Irrführung geeignete Angaben macht, setzt sich der Gefahr des Ausschlusses von der Ausbildung bzw. der Entziehung des Führerscheines aus.

Jede Frage ist wichtig

Ich bin mit der Bekanntgabe des Untersuchungsbefundes an Behörden, Flugausbildungsstellen, Luftfahrtunternehmen und nachuntersuchende Ärzte einverstanden.

Unterschrift des zu Untersuchenden

Beruf des Vaters:

Gesundheitsverhältnisse der Familie (chronische und andere wichtige Krankheiten sind anzugeben, ebenso die etwaige Todesursache und das Todesalter):

Eltern:

Geschwister:

Großeltern:

Sind insbesondere in der Familie vorgekommen:

Tuberkulose?

Nerven- oder Geisteskrankheiten, Selbstmorde, Trunksucht?

Seit wann ist der zu Untersuchende verheiratet?

Wieviel Kinder hat er?

Sind Ehefrau und Kinder gesund, oder woran leiden sie?

Krankheiten in der Kindheit (Malaria, Scharlach mit oder ohne Begleitkrankheiten, englische Krankheit, Keuchhusten, Drüsenkrankheiten usw.)?

Krankheiten im späteren Alter:

Krankheiten der Atmungsorgane:

Bronchialkatarrh (Neigung zu Erkältungen)?

Lungenentzündung?

Tuberkulose (Lungen Spitzenkatarrh, Lungenkatarrh usw.)?

Brustfell-, Rippenfellentzündung?

Asthma (auch Heuschnupfen und verwandte Krankheiten)?

Andere Krankheiten der Atmungsorgane:

Gelenk-, Muskelrheumatismus?

Herz- und Blutgefäßerkrankungen (Hier ist auch anzugeben, ob mit Rücksicht auf das Herz vorübergehend oder dauernd gewisse Schonungen verordnet oder angewandt wurden!)?

Ansteckende Krankheiten (z. B. Diphtherie, Ruhr, Malaria, Typhus usw.)

Geschlechtskrankheiten (Angaben der Krankheitserscheinungen und der Kuren?)

Wurde eine Blutuntersuchung gemacht?

Wann und mit welchem Ergebnis?

Erkrankungen der Baucheingeweide:

Magen- und Darmkrankungen (auch geringe!)?

Gelbsucht?

Nieren- und Blasenleiden?

Andere Leiden der Baucheingeweide (Gallensteine, Gallenblasenentzündung, Wurmkrankheit, Leistenbruch usw.)?

Hautkrankheiten:

Nervenleiden, insbesondere:

Krämpfe (auch auf einzelne Körperteile beschränkte)?

Ohnmachtsanfälle (auch sogenanntes Schlechtwerden)?

Schwindelanfälle?

Migräne oder andere Kopfschmerzen?

Sonstige Nervenkrankheiten (Lähmungen, Neuralgien usw.)?

Achtung! Jede Frage ist wichtig! Zeit der Erkrankung, Verlauf und Folgen sind jedesmal anzugeben!

Halstraupheiten (z. B. Mandelentzündungen, Heiser-
ken usw.)

Stimm-, Rachen- und Stimmritzerkrankungen?

Ohrenleiden (z. B. Mittelohrentzündungen, Ohrenlaufen,
Tubenkatarrh, Schwerhörigkeit, Ohrenbeschwerden bei
Höhenmangel)?

Augenkrankheiten?

Unfälle, äußere Krankheiten, Verwundungen,
Operationen?

Sonstige nicht erwähnte Krankheiten (Zur den-
kbarkeit kann auch eine scheinbar geringe Krankheit
wichtig sein)?

Renaufenthalt in Heilstätten, Sanatorien, Bade-
orten usw., wann, wo, aus welchen Gründen,
auf welche Zeit und mit welchem Erfolge?

Gebrauch von Tabak, Alkohol?

Morphium, Kokain oder dergl.?

Welchen Sport hat der Untersuchte getrieben?
(Sportarten und besondere Leistungen)

Ist der Untersuchte bereits gefallen? Welche
Schwermere seiner Fliegergeschäfte und Angabe von
Schwierigkeiten beim Abflug, Spiralflug, Höhenflug,
Notlandungen, Bruchlandungen.

Welchen Luftfahrerschein besitzt gegebenenfalls
der Untersuchte?

Schulbildung?

Ich versichere, daß ich vorstehende Angaben vollständig und nach bestem Wissen gemacht habe
und daß die Zusätze des Untersuchers meinen Angaben entsprechen.

Unterschrift des Untersuchten

Nr.

Name:

Datum:

Untersuchungsbefund:**L****Allgemeinbefund:**

Alter: Körpergröße cm: Körpergewicht kg:

Halsumfang: cm Schilddrüse:

Brustumfang (bei waagrecht erhebenem Armeu zu messen):

nach härtester Einatmung: cm

nach härtester Ausatmung: cm

Taibumfang (unter dem Taibel gemessen): cm

Körperbau:

Gang und Haltung:

Muskulatur:

Fettpolster:

Haut und sichtbare Schleimhäute:

Narben oder Spuren überstandener Hautkrankheiten oder der Anwendung äußerlicher Heilmittel oder Einspritzungen:

Drüsen:

Gelenke:

Folgen früherer Unfälle, Verwundungen, Operationen und Mißbildungen:

Ba. R. oder andere serologische Untersuchungen:
(wenn erforderlich)**Augenbefund:**

Augenbewegungen:

Bindehaut und Lidränder:

Papillen (Form und Größe auch im gegenseitigen Vergleich):

Reaktion auf Lichtreiz: R.

beim Sehen in die Nähe: R.

Accommodation (Angabe der Untersuchungsmethode und des Ergebnisses):

Doppeltsehen:

Gesichtsfeld:

II.

Untersuchung der inneren Organe:**Lungenbefund:**

Ergänzung der speziellen Vorgeschichte nach nochmaligem Befragen:

Brustkorb (Form, Vergleichung beider Hälften, Verhältnisse bei Schließung, etc.):

Pertussorischer und auskultatorischer Befund:

Atemung (Tiefe, Rhythmus, Vergleich beider Brusthälften usw.):

Auswurf:

Röntgenbefund:

Herzbefund:

Ergänzung der speziellen Vorgeschichte nach nochmaligem Befragen (Gelenkrheumatismus usw.):

Grenzen der relativen Dämpfung:

Spitzenstoß (Ort der Sichtbarkeit, Fühlbarkeit.)

Herztöne:

Pulsbeschaffenheit:

Herzfunktionsprüfung:

	Puls in $\frac{1}{4}$ Min.	Blutdruck ^{**)}	
Ruhe			
nach Arbeit ^{*)}			
nach ^{***)}			
nach ^{***)}			
nach ^{***)}			

^{*)} nach 10-maligem Besteigen eines Stuhles innerhalb 30 Sekunden.^{**)} in der Mitte des Oberarmes in Herzhöhe b. Sitzen. Systolischen und diastolischen Druck angeben. Angabe, ob in H₂O oder Hg.^{***)} Zeitabstände nach Ermessen des Untersuchers.

Nr.

Name:

Pat.

Beschaffenheit der Gefäße:

Röntgenbefund:

Elektrokardiogramm (falls erforderlich)

Befund der Verdauungsorgane:

Ergänzung der isophtalen Bariumschicht nach mechanischem Befund:

Zunge (auch auf Zungenbissnarben achten!)

Zähne

(Angabe, ob genügend Kauheiten, oder behandlungsbedürftige Zähne vorhanden, Umfang und Sitz von festem oder losem Zahnerlag.)

Mundschleimhaut:

Leib: (Wölbung und Spannung, Bauchmuskulatur, Druck- und Klopfen)

Leber (Grenzen, Süßbarkeit):

Milz (Grenzen, Süßbarkeit):

Eingeweidebrüche:

Befund der Harn- und Geschlechtsorgane:

Angaben hierüber:

Harn:

Farbe und Durchsichtigkeit:

Sediment:

Spezielles Gewicht:

Reaktion:

Eiweiß:

Zucker:

Blutbefund: (wenn nötig):

Neurologisch-charakterologische Untersuchung:**Ergänzung der speziellen Vorgeschichte**

Erbliche Belastung (Zwangsneurosen, Psychosen, Trunksucht, Epilepsie, Selbstmorde):

Frühpsychopathische Züge (Wettnarren, Stottern, Dunkelangst usw.):

Nervenzusammenbrüche, auffällende Reaktionen, Erregbarkeit, Ausdauer, Verhalten bei auftretenden Ereignissen:

Befund:

Körperbautypus (leptosom, pyknisch, athletisch, dysplastisch):

Neuropathische Stigmatisierungen: (flughaliende Form und Stellung der Ohren, Sacus neuropathica, hoher Schimmel, Prognathie, Vasolabilität, Hyperhidrosis, gesteigerte Reflexerregbarkeit usw.):

Hirnnerven:**Sprache:**

Motilität (starke Kraft, Muskelschwäche)

Sensibilität:

Reflexe (Sehnen- und Hautreflexe):

Pathologische Reflexe, Pyramidenzeichen (Romberg, Gang mit offenen und geschlossenen Augen, Patoms Seigerversuch usw.):

Psyche:

Robust oder sensibel:

Labil oder stabil:

Lebhaft oder gleichmütig:

Schlagfertig oder gehemmt:

Aufmerksamkeit:

Wahrnehmungsfähigkeit:

Merkfähigkeit (zusammengesetzte Sachhaltigkeit)

Kopfrechnen

Unterschiedsfraagen (z. B. Kuh-Leich, Treppen-Vertor, Rind-Zwerg, Jertum-Lüge):

Verhalten aus dem Schul- und Allgemeinwissen:

Verhalten bei der Untersuchung:

Sonstiges Auffallende und Intelligenzlage:

Nr.

Name:

Ort:

Zusammenfassendes Endurteil (aus Vorgeschichte von Untersuchungsanlass und Verlauf und der inneren-neurologisch-charakterologischen Untersuchung).

(Es ist besonders hervorzuheben, ob der Untersuchte in allen Punkten den vorgeschriebenen Anforderungen entspricht.)

Ist vor Erteilung des Führerscheines eine Nachuntersuchung erforderlich oder überhaupt notwendig?

(Angabe, auf welchem Gebiet und mit welcher Methode.)

S E C R E T

APPENDIX VII

PRINCIPLES OF CONSTRUCTION OF
MODERN MILITARY HOSPITALS

S E C R E T

SECRET

PRINCIPLES OF CONSTRUCTION OF MODERN MILITARY HOSPITALS

Site.

The site of a projected hospital should be chosen so as to extend as far as possible to the South and away from military installations, factories, railway stations etc. Suitable water and drainage facilities should be considered in the first instance. The size of the site will be determined by the number of beds required, a general working formula being 200 square metres of land per bed projected.

Sufficiently large hospital grounds are important in the case of a military hospital because a soldier unlike a civilian patient can only be discharged when he is completely fit for duty and provision for sports and open-air games under medical supervision is of prime importance.

Size of Hospital.

The number of beds should be calculated on the basis of the military units situated in the region of the hospital. This is generally calculated as follows: 4% of the strength of the nearest garrison; 2% of the surrounding military units who have no other medical facilities. The area covered by the hospital's responsibility will depend on transport facilities, but the tendency is to take in an area within 50 km. of the site.

Hospital Building.

The trend in modern military hospital construction is away from the pavilion system and back to the block system. All sick wards should be located in the same building with the exception of a small isolation ward which should be connected with the main building by a passageway. The sick wards should face south, and should be fronted in the case of the ground floor by a wide terrace and in the case of upstairs floors should be fronted by a balcony. These balconies should not be wider than $1\frac{1}{2}$ metres to prevent overshadowing the ground floor. (See sketch at the end of this appendix).

The wing in which patients are treated should be at right angles to the sick wing, generally at the middle of the block.

As far as possible architecture should conform to the surroundings; e.g. brick buildings where this is common, artificial stone where stone buildings predominate. The value of tasteful decoration of halls, staircases, etc., cannot be over-emphasised.

The basic principles governing internal arrangements are that all avoidable noise should be kept away from the corridors occupied by the patients. To this end; it is advisable to ensure that the main entrance is not located at the main southern frontage, that the sick rooms are at least 50 metres from a road-
way, that out-patient departments with their inevitable traffic do not intrude upon the wards, and that the distribution of food and servicing traffic does not interfere with the patients.

SECRET

In my view it is absolutely essential that doctors' and nurses' living quarters should not be located in corridors adjacent to the sections.

Sections.

The size of the section will depend upon the size of the hospital but the following sections are more or less standard in the Luftwaffe.

Section 1 - Internal diseases.

2 - Surgery

3 - Skin and V.D.

4 - Eyes

5 - Ear, nose and throat.

6 - Nervous and mental disorders.

7 - Dental and jaw injuries.

8 - Observation.

In the G.A.F. Sections are built up upon a unit of 35 beds called a "Pflegeeinheit" (nursing unit). A normal ward consists of two Pflegeeinheiten, i.e. 70 beds. Each Pflegeeinheit consists of the number of rooms necessary to accommodate 35 beds, the requisite number of nurses' rooms, 3 baths, 8-9 washbasins, 4-5 lavatories, one storage room, one room for the I.O. of the Pflegeeinheit, one room for his chief nurse, and one room for the day and night watches.

Sick Rooms.

The 35 beds of the Pflegeeinheit will naturally be accommodated in a number of rooms, each room being called a "sick" room. 35 cubic metres are given for each bed, and with an average ceiling height of 3.3 - 3.5 metres, this corresponds to 10 square metres of floor space per bed. Provision should exist for subdividing a room, so that a sub-division housing one or two beds for officers or the the seriously ill, can be made. A sick room has normally four to six beds, but with the original provision of 10 square metres floor space per bed, six beds may be put into a four-bed room, and eight to ten beds can be placed in a six-bed room with safety.

Treatment Wing.

This usually opens out from the middle of the block and perpendicular to it in such a way that treatment rooms are on the same floor as the corresponding ward. Auxiliary accommodation for each of the eight types of wards already listed are as follows:

Section I. 1 examination room

2-3 laboratories

1 room for electro-cardiography

1 spare room.

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Section II Operating theatre for sepsis, with 25-30 square metres floor space, and 4-5.5 metres high.

1 room for urological treatment (large hospitals only).

1 room for plaster dressings

1 dressing room.

1 sterilising room.

2 rooms for preparing operations.

1 M.O.'s room and

1 Nurses' room

Section III 1 Examination room.

1 Dressing room (also minor surgery)

1 laboratory

1 injection room (gonorrhoea)

Section IV, V & VII. Each has 1 examination room and one operating theatre.

Section VI & VIII 1 examination room each.

Section IX. 1 examination room.

1 lying-in room.

(Ward IX operations are carried out in Ward II).

Physical Therapy Department.

In this department all physical therapy is done. Depending upon the size of the hospital there are either three or five baths for medicinal or carbon-dioxide - oxygen air bubble baths, and one tub for under-water massage. A bath-size of 5 x 5 metres has been found best, and each bath is separated from its neighbour by curtain. Rooms with a single bath are not considered advisable as ventilation is better and certain claustrophobia effects are avoided in a large room with several baths. An exception to this however is made in the case of sulphur baths where odours would be objectionable in a communal room.

One type of medicinal bath had been found extremely effective for rheumatism, neuritis and general exhaustion. This is called the "Stangerbath". It is an electrical bath in which the patient sits in a solution of tanning bark, through which an electric current flows.

The bathing departments in most hospitals also include one or two rooms for electro-therapy, a hot-air bath, a massage room, a small gymnasium and dressing rooms.

S U B J E C T

Pharmacy.

The pharmacy of a Luftwaffe hospital had to cope not only with the demands for medicine made by its own doctors, but also with the requirements of troops in the vicinity, (i.e. Air Force personnel). The pharmacy is run by a civilian with the rank equivalent to Hauptmann.

The location of the pharmacy should be such that messengers calling for supplies for outside units do not have to traverse the hospital. In modern hospitals, the pharmacy is usually near the main entrance.

The pharmacist has a prescription room and the necessary equipment for making up his medicines. The greater part of medical preparations however are available in standard packages, tablets, tubes etc., and the work of the dispensing chemists is confined to special prescriptions. The pharmacy consists, generally of one room for the dispensing chemist, a small chemical laboratory, a room where bottles can be washed, and a special small store room for keeping inflammable liquids.

Kitchen and Laundry.

Both of these should be located to one side of the main building in order to avoid inevitable odors reaching the sick block. The ideal arrangement is to provide a passageway - sometimes underground - from the kitchen and the laundry to the cellar of the sick block. Both food and linen can be wheeled along this passageway to the sick block cellar, and thence taken up by lift to the ward itself.

In addition to the general kitchen, a special kitchen should be provided for patients requiring special cooking - up to one-third of the total of patients. This should be completely separate from the general kitchen, and must be entirely self-sufficient in equipment and stores.

The laundry should be equipped with the usual washing, drying and pressing machines, and should also have provision for receiving long laundry.

Mortuary.

This should contain a small chapel for funeral services abutting on a parade ground where the parade for a military funeral can take place. It should also be equipped with a post-mortem room, a small laboratory, and refrigerating plant.

The Boiler House.

This should contain not only the hot water system for heating wards and quarters, but should also house the plant for producing high pressure steam for sterilisation purposes. The boiler house is also the best place for an incinerator for the destruction of used dressings and similar refuse. The boiler house should incorporate a coal dump with a capacity of one-third of the yearly consumption.

Quarters.

Where the isolated location of the hospital makes this necessary, special quarters should be provided for unattached medical officers, nurses and civilian employees. The following particulars are regarded as fulfilling the requirements.

- 5 -

SECTIONS

For Medical Officers - 1 bedroom, 1 living room, giving a total area of 35 square metres.

For Nurses - 1 bedroom, 1 living room, total 30 square metres.

For Medical Orderlies- A single room, 14 square metres floor area, (Sergeant rank)

Medical Orderlies

(Corporal rank) - 9-12 metres floor space in rooms housing 2-4 men.

Apart from the foregoing, it was general practice to provide military quarters for certain members of the staff, which had to be paid for by the individual from his military pay.

In this essay I have given what I consider to be the essential details in the construction of a modern military hospital. These however are the bare essentials and a full description of such a hospital would necessarily extend far beyond the scope of the present paper. One basic principle should be adhered to on all questions concerning a military hospital - to retain as far as possible a military atmosphere. The soldier must receive all that modern medicine can offer him, but he must not be estranged from the military atmosphere into which he has been conditioned.

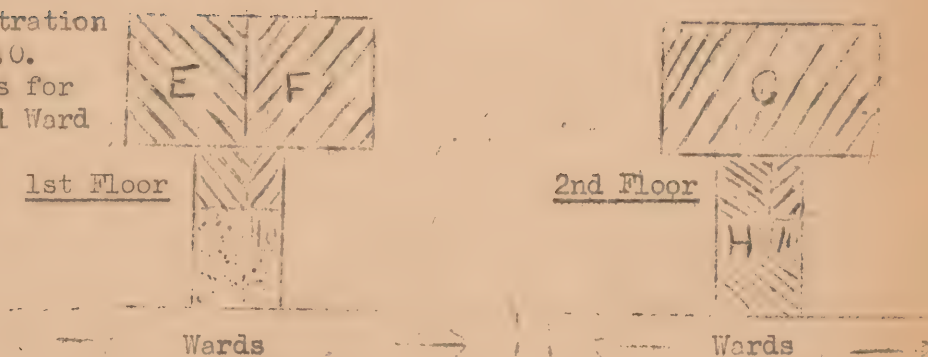
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GENERAL LAYOUT OF A MILITARY HOSPITAL



Plan of Ground Floor

- E = Administration
 F = Chief M.O.
 G = Theatres for Surgical Ward
 H = X-ray



- J = Storerooms
 K = Ear Nose & Throat Clinic
 L = Eye Clinic
 M = Recreation and Rest Rooms
 N = Skin and V.D. Clinic



(Extracted from A.D.I. (K) Report No. 346/1945)

S E C R E T

APPENDIX VIII

ORGANIZATION AND APPROXIMATE STRENGTH
OF A 500 BED LAZARETTE

S E C R E T

APPENDIX VIII

Organization and approximate strength of a Lazarett with 500 Beds.

Section I	Internal Medicine	150 Beds
Section II	Surgery	150 "
Section III	Dermatology and Venereal Disease	75 "
Section IV	Ophtalmology	50 "
Section V	Otolaryngology	50 "
Section VIII	Aviation Medicine (Sichtungs Abteilung) . . .	<u>40 "</u>

TOTAL .. 515 Beds

Section VII X-Ray Department
without beds.

Personnel.	Med. Off. and Assist.	Admin. Enpl. ("Boatmen")	Enl. German Men. Red Cross Nurses.	Civil Enpl.	Labor ers.
Chief Physician (Colonel or General)	1				
Executive Officer (Captain)	1				
Dentist (Captain)	1				
Pharmacist		1			
1st Staff Sergeant			1		
Bookkeeper (S/Sgt.)			1		
Medical Supply Clerk (T/Sgt.)			1		
General Supply Clerk (Cpl.)			1		
Massour (S/Sgt.)			1		
Sterilization room attendant (S/Sgt.)			1		
Dental Technician (T/Sgt.)			1		
Hydro-therapist (T/Sgt.)			1		
Assistant Pharmacist (T/Sgt.)			1		
Assistant Pharmacist (female)				3	
Laboratory Assistant (T/Sgt.)			1		
Laboratory Assistants (female)				2	
Dental Assistant (female)				1	
Chief Nurse			1		
Technicians (female)				3	
Dietician (female)				1	
Physical Instructor				1	
Attendant (female)				1	
Finance Employees		3			
Finance Assistant (T/Sgt.)			1		
Mass Corporal			1		
Attendants (female)				2	
Office Personnel				2	
Charge of Quarters				1	
Gardner				1	
Chief Housekeeper (female)				1	
Housekeeper (female)				1	
Laborers					80
Drivers					3
Section I Internal Medicine	2		1	16	1
" II Surgery	3		3	13	1
" III Dermatology & V.D.	1		1		1
" IV Ophthalmology	1		1	5	1
" V L.N.T.	1		1	6	1
X-Ray Department	1		1		2
Section VIII Aviation Medicine (Sichtungsabteilung)	2		1		2
	10		24	50	29
					83

TOTAL: 204 Persons.

For every 100 beds, there are 3 medical interns and 6 student nurses.

S E C R E T

S E C R E T

APPENDIX IX

COPY OF THE UNIT SICK REPORT

S E C R E T

**Zehntägiger
Monatlicher**

(Nichtzutreffendes durchstreichen)

Anlagen:

Truppenfrankennachweis

vom

194 bis

194

(Der zehntägige Zeitabschnitt umfaßt die Monatsstage 1. - 10., 11. - 20. und 21. bis Monatschluß)

über

(Im vollständigen Text der Tabelle ist über nur die Bezeichnung der Truppenteile nach Dienstverhältnis anzugeben)

I. Die durchschnittliche Zahl der Betroffenen

Offiziere	Beamte	Unteroffiziere und Mannschaften	insgesamt	davon befanden sich	
1	2	3	4	San. Off.	Offiz. u. Mann. R.
5	6				

II. Krankenübersicht

	Bestand waren	Zugang an		Es wurden behandelt (Spalte 2-4)	Abgang aus der truppenärztlichen Behandlung und alle Todesfälle				Saldo waren
		Verwundungen und Verfrankungen durch Feind- einwirkung	andere Kranken		tot (In Lazaretten verstorben bzw. in dieser Spalte nicht (100))	ins Laza- rett	ander- weit (100*)	Summe (100)	
1	2	3	4	5	6	7	8	9	10
a) Offiziere									
b) Beamte									
c) Unteroffiziere und Mannschaften									
d) Summe									
e) darunter befanden sich Sanitätsunteroffiziere, Mannschaften und Sanitätsbeamte									

III. Todesfälle

Die Todesfälle verteilen sich auf:

Der Tod trat ein infolge	Offiziere	Beamte	Unteroffiziere u. Mannschaften	Summe	Summe Todesfälle von Offizieren, Beamten, Unteroffizieren und Mannschaften
1	2	3	4	5	6
a) Verwundungen und Verfrankung durch Feindeinwirkung					
b) Unfall					
c) Krankheiten (einschl. Geschlechts- krankheiten mit tödlichem Ausgang)					
d) Brandbeulen					
e) Summe					
f) Summe durch heimliche Mord- tode (einschl. Mordtaten in Gefangenschaft bzw. durch Selbstmord)					
IV. Vermerkte					

a) durch Feindeinwirkung, b) durch Unfall

c) durch Krankheiten

Kürzer Bericht

über

1. a) schärfste Aufklärung von arbeitsträgenden und gesundheitsgefährdenden Verhältnissen, die der Arbeiter aus gesundheitlichen Vorbeugungsmaßnahmen:

b) allgemeine gesundheitliche Verhältnisse und Maßnahmen:

2. Erläuterungen der Kampfstoffverletzungen.

Bei Nr. Nr. 31 kamen in Zugang wegen:

a) Augenreizstoffe

c) erstickende Kampfstoffe

b) Nasen- und Rachenreizstoffe

d) ätzende u. sonstige Gifte

3. Erläuterung der bei Nr. Nr. 12 zugegangenen Krankheitsfälle nach Krankheitsart:

" " " " " " " " " " " " " " " "

4. Es sind enthalten im Nachw. Nr. 34 Erkrankung an Höhenkrankheit

5. Unter den Zugängen sind enthalten:

bei Nr. Nr. 13 und 15 Rückfälle und Folacerkrankungen

" " " 14 Wiederholungsgefahren.

Gelesen:

, den

194

S E C R E T

APPENDIX X

AIR TRANSPORT REPORT

S E C R E T

Ordained for Director of C. I. B. 1904.

Copy for Control - Jive for Medical
Sections.

...

Pilot 1.0, or Medical U.S.O.

✓ TO CONTINUE

Signature of O.C. of duty ambulatory flights or

October 1, 1960.....

Signature of attendant H.O. or N.C.O.

(Mario and Zerk)

S E C R E T

APPENDIX XI

TRANSPORT REPORT

S E C R E T

Directions for filling out the form, the following is to be noted.

- a) Designation of the number of the duty ambulance flight or the designation of the flying formation must always be shown under "Unit to which A/C belongs." Field postal number is not to be given there. In case the A/C must start again before the form can be filled out, the information for the headings can be obtained from the log book.
- b) In cases where the patient is unconscious, and if there are no personal papers in his possession, at least the number of the identification disc will be put in column 2.
- c) Columns 4 to 7 are to be filled out with special care. In the appropriate column a "1" is to be placed.
- d) In cases of passengers, who are transported in a duty ambulance A/C, the names and units of passengers transported in duty ambulance A/C must be placed in columns 2 and 3. In column 13, the reason for the transport must be given (for example, "courier", "for leave" etc.) and a "1" must be placed in column 8).
- e) In column 9, general designation of illness is to be avoided if possible (for example, "kidney trouble"), and in its place, the specific diagnosis should be given (for example, "kidney stones, right", or nephritis"). Only in this way is a scientific evaluation possible).
- f) The exact date in column 10 is only necessary for wounded cases.
- g) It should be shown in column 12 to what hospital the wounded or sick is intended to be sent after leaving the A/C, since only in this way can track be kept of the casualty and information as to his whereabouts supplied.
- h) In each case the total of the appropriate vertical column should be placed over the word "Summe" (total).
The remaining blanks at the foot of the form are also to be completed for each transport flight.

S E C R E T

APPENDIX XII

AIRCR FT ACCIDENT REPORT

S E C R E T

Hin den Sachverständigen

Ärztliche Flugunfallmeldung

Hin den Sachverständigen

Flugzeug: a) D-... b) Hersteller: ... c) Besatz:

Art- und Name des Luftfahrzeuges:

Ort und Zeit:

Flugzeug und Besatz:

Stichtag und Uhrzeit:

Ort: ... in der: ...

Zeit: ... Ort: ...

A. Kurze Schilderung des Unfallherganges:

B. Verhalten des Flugzeugführers:

a) Wurde der nach Sachlage bestmögliche

b) Liegt ein fehlerhaftes Verhalten des Flugzeugführers, ein Bedienungs- oder Steuerfehler vor und welcher?

c) Was wird als Ursache für den Fehler des

d) Liegt ein Verstoß gegen gesetzliche oder sonstige Vorschriften vor?

Ist der Unfall auf Oberflächlichkeit oder

e) Ist der Unfall ein Beweis einer allgemeinen geistigen oder charakterlichen Unfähigkeit für die Tätigkeit als Flugzeugführer?

f) Sonstiges:

1. 1. 1911

1. 1. 1911

1. 1. 1911

1. 1. 1911

1. 1. 1911

1. 1. 1911

1. 1. 1911

1. 1. 1911

1. 1. 1911

1. 1. 1911

1. 1. 1911

1. 1. 1911

1. The first part of the paper is devoted to a general discussion of the problem.

2. CONCLUSIONS

The results of the investigation are summarized in the following conclusions:

1.

(Unauthenticated)
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S E C R E T

APPENDIX XIII

DESCRIPTION OF TESTS

S E C R E T

R E S T R I C T E D

APPENDIX XIII

Description of Tests Used by GAF Psychologists

1. WRITING AN ESSAY

Hypothesis. This test was thought to measure general intellectual ability and capacity for abstract thinking.

Description. One or more essays might be required. The candidate was permitted to select his subject from a list and was told he could write in any way he chose. Three distinct types of subjects were used:

- a. A list of abstract subjects such as "Flying with Gliders" or "Culture and Civilization", from which the candidate could choose one;
- b. A series of pictures from which the candidate could choose one to write about; and
- c. List of subjects that were very personal, such as "My most embarrassing moment", from which the candidate could choose one.

Time Limit. Twenty minutes was allowed for each essay.

Scoring. The examiner spent from ten to fifteen minutes scoring each essay. Although no standardized grading system was used, the following outline includes the main points that the examiner tried to consider.

- a. Ability to organize and to use imagination.
Understanding the theme.
Organizing thoughts.
Developing abstract ideas.
Overall effect or Gestalt such as form, content and neatness.
- b. Type of thinking.
Direction of thinking - concrete or abstract; subjective or objective.
Umfang - depth and flexibility of feeling.
Course of thinking - logical, directed, intuitive or forceful.
- c. Style - simple, clear or complicated.
- d. Ripeness of thinking.
Overall result.
Balance between ability and will to express himself.
Originality.
- e. Characterological analysis.
The side of the personality most touched upon.
Personal maturity.
Sincerity.

2. VERBAL MEMORY TEST

Hypothesis. This test was designed to measure verbal memory.

Description. A paragraph containing twenty key words was read aloud twice to a group of applicants. The first time it was read slowly and special emphasis was given to the key words. The second time it was read at normal speed and the meaning of the whole paragraph was emphasized. At the end of the second reading the candidates were given another test, usually the mental arithmetic test. After this test was completed, candidates were asked to write down as completely as they could the paragraph which had been read. An alternative memory test of lesser difficulty containing only ten key words, was available. Equivalent forms of each test were also available.

R E S T R I C T E D

R E S T R I C T E D

Time Limit. Liberal.

Scoring. One point was given for each key word reproduced exactly and one half point for each word for which the meaning only was remembered.

<u>Norms.</u>	<u>Score.</u>	<u>Rating.</u>
	20	9
	18 - 19	8
	16 - 17	7
	14 - 15	6
	12 - 13	5
	9 - 11	4
	6 - 8	3
	4 - 5	2
	0 - 3	1

3. MENTAL ARITHMETIC TEST.

Hypothesis. This test was designed to measure ability to concentrate and facility in numerical operations.

Description. Ten problems in arithmetic, ranging in difficulty from " $8 + 4 - 3$ " to " $16 + 4 \times 6 - 7 - 9 - 3$ ", were read aloud rapidly to a group of applicants who wrote down the answers. Then the test was repeated with a second similar series of ten problems.

Time Limit. The first series was read in thirty seconds; the second series in twenty-four seconds.

Score was the number correct.

<u>Norms.</u>	<u>Score.</u>	<u>Rating.</u>
	19 - 20	9
	17 - 18	8
	15 - 16	7
	13 - 14	6
	11 - 12	5
	9 - 10	4
	7 - 8	3
	5 - 6	2
	0 - 4	1

4. ARITHMETIC PROBLEMS.

Hypothesis. This test measured speed and accuracy in computation and in solving simple mathematics problems. Performance was thought not to be influenced by the amount of mathematical training in school.

Description. The test comprised two printed pages. The first page contained twelve problems in addition, subtraction, multiplication and division. The second page contained eight problems such as the following: "The price of an airplane is 6,000 marks. A man saves 120 marks a month. How many months will it take him to buy an airplane?"

Time Limit. for the entire test was 8 minutes.

Score. The number correct.

R E S T R I C T E D

R E S T R I C T E D

<u>Norms.</u>	<u>Score.</u>	<u>Rating.</u>
	20	9
	18 - 19	8
	16 - 17	7
	14 - 15	6
	12 - 13	5
	10 - 11	4
	8 - 9	3
	6 - 7	2
	0 - 5	1

5. JUDGMENT TEST.

Hypothesis. This test was designed to measure practical judgment

Description. A printed group test was used containing several items, each of which described a problem requiring practical judgment for its solution. An item, for example, might be the description of a problem facing a troop commander who must reach an objective, and who has three routes open to him: (1) a direct route which is under fire; (2) a longer route across a bridge that is partially damaged; and (3) a route across a lake, where no boat is available. The candidate was required to write an account of what he would do in this situation, giving the reasons for his action.

Time Limit. Liberal.

Scoring. Subjective. No single choice was considered the correct answer to a problem, but emphasis was placed on the reasons given for a particular choice of action.

6. MECHANICAL COMPREHENSION - MOVING PICTURE TEST.

Hypothesis. This test was designed to measure ability to understand mechanical principles.

Description. A moving picture containing animated drawings of fifteen different mechanical devices was shown to groups of candidates. Afterwards each candidate was given schematic drawings of the devices and required to describe how each apparatus worked and to indicate the function of important parts.

Time Limit for completing the answers was liberal.

Score. Credit was given for each item if the principle of operation was understood correctly. Half-credit was given in doubtful cases.

<u>Norms.</u>	<u>Number Correct.</u>	<u>Rating.</u>
	15	9
	14	8
	12 - 13	7
	10 - 11	6
	8 - 9	5
	6 - 7	4
	4 - 5	3
	2 - 3	2
	0 - 1	1

7. MECHANICAL COMPREHENSION - INTERPRETING DRAWINGS.

Hypothesis. This test was designed to measure ability to understand mechanical principles.

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Description. A simplified version of the motion picture mechanical comprehension test, this test consisted of a schematic drawing of a rather complex mechanical device, accompanied by a brief description of the device. The candidate was required to write a general description of the device, explaining how it worked and answering several general questions on its operation. Alternative questions were available. This form was used at times as a substitute for the moving picture test.

Time Limit. Twenty minutes.

Score. Subjective.

8. MECHANICAL ASSEMBLY TEST.

Hypothesis. This test was designed to measure practical mechanical ability.

Description. The candidate was shown a mechanical device which had been taken apart except for one or two pieces. The general purpose of the device was explained. He was then required to put it together. The device was made from gears, levers and pulleys, but in its completed form was unfamiliar to the candidate. Several alternative tests were available.

Time Limit. Liberal.

Scoring. Subjective. Emphasis was placed on the manner of work as well as on the final result. Several correct solutions were possible.

9. GENERAL OBSERVATION TEST.

Hypothesis. The test measured ability to recall accurately observations of events and happenings.

Description. Five minute sequences which had been selected from popular movies were shown to a group of candidates. The candidates then were asked to write a description of what they had seen, noting exactly what had happened, especially the temporal sequence of actions.

Time Limit. Twenty minutes were allowed for writing the description.

Scoring. Subjective. Maximum credit was given for exact observation of events rather than for description of individuals or places.

10. DISTANCE PERCEPTION - HOROPTOSCOPE.

Hypothesis. This test had a dual purpose. It was designed to test distance perception and was also believed to indicate lability of the personality structure as revealed by the Kovarianton Phenomena of Jaensch and Fisher.

Description. The apparatus consisted of an oblong box fitted with an eyepiece. The interior was uniformly illuminated. Three parallel black horse hairs were suspended inside the box. Two of these were fixed and the third could be moved toward or away from the observer by means of a wheel on the outside of the box. The test was given in two parts. In the first part the two fixed hairs were both 30 centimeters from the eyepiece and the task of the observer was to adjust the third hair until it was judged to be the same distance away. In the second part of the test, one of the two fixed hairs was at a greater distance from the eyepiece than the other, and the task was to adjust the movable hair until it was judged to be in the same plane with the other two, i.e., until all three hairs were judged to be on a straight line with respect to each other, but at different distances from the eyepiece.

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Time Limit. Liberal.

Score was the average error in millimeters.

11. DISTANCE PERCEPTION - HERRING'S FALLING MARBLES APPARATUS.

Hypothesis. This test was designed to measure the ability to judge distance from binocular cues.

Description. The candidate observed through an eyepiece as marbles were dropped at varying distances from his eyes and estimated the distance of each. He could see only the marble as it fell and not the hole through which it was dropped. This test was duplicated to some extent by tests given in the medical examination, and was later discontinued, probably for this reason.

Score. was the average error of estimation.

12. EXNER'S SPIRALE.

Hypothesis. This test was used to study personality structure.

Description. The candidate was required to fixate on a black spiral (Exner's or Plateau's spiral developed about 1850) for three minutes while the spiral was rotated. He then was told to fixate on a white background and report what he saw.

Score. The time of the beginning and end of the after image was recorded. An average duration of the after image was considered good and an extremely short or extremely long duration was thought to be bad.

13. AUBERT TEST.

Hypothesis. This test was employed by Jaensch over twenty years ago in the study of personality structure.

Description. The candidate wore a pair of special lenses which made all straight vertical lines appear curved. His task was to adjust a line, which was actually vertical but appeared to be curved, until it was judged to be straight. This was done by operating a hand wheel.

Time Limit. Liberal.

Score was the amount of curvature put in the line. Certain limits were considered normal. More or less than this amount was believed to indicate either an extremely labile or an extremely stable personality, both of which were considered undesirable in aircrew members.

14. ORIENTATION TEST.

Hypothesis. This test was designed to measure the ability to remember the direction of and relationship between various points that had been observed.

Description. The test included a period of preliminary observation followed by two sub-tests. The candidate was first taken for a walk during which 10 to 12 points (targets) in the town were pointed out to him. He was then returned to the testing station and taken into a room in which there was a large circular tent. Examiner and candidate entered this tent and the entrance was closed in such a manner that the point of entry could not be detected.

In the first sub-test the candidate was required to indicate, by means of a large pointer located in the center of the tent,

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the exact direction of each of the targets that had been pointed out to him. Next he was told to imagine that he was at one of these points and to indicate the exact direction from this point to each of the remaining targets.

In the second sub-test the entire tent was made to rotate in one direction while the candidate and examiner walked around in the other direction until the candidate was completely disoriented. The interior of the tent was relatively dark during this time. The entire test, as previously administered, was then repeated. Next the candidate was told that the first target was not where he had just indicated it to be, but in some other direction (this direction was shown). He was then required to re-orient himself and give again the direction of the other targets.

Score was the number of degrees of error made in indicating each target. Special attention was paid to the last part of the test.

15. REVOLVING CHAIR TEST.

Hypothesis. This test was designed to determine how well an individual could orient himself by the use of auditory and visual cues when these were in conflict with sensations of movement. It was an adaptation of the Barany chair.

Description. The test was given in three parts.

In Part 1, the candidate was blindfolded and seated in a chair which revolved around a vertical axis through its center. The candidate was instructed not to move his head. The chair was given an initial push of sufficient force to produce about thirty revolutions and allowed to coast to a stop. The candidate was instructed as follows - "During the test, tell us: 1. Whether you are in motion or at rest; 2. In which direction you are turning; and 3. What sensations you experience". The chair was rotated several times in each direction. It was reported to be very difficult for the candidate to perceive the exact moment when motion stopped. It was normal to experience an after-sensation of turning in the opposite direction. The duration of the original sensation of movement of the actual turning and of the after-sensation was noted.

In Part 2, the candidate was shown a metronome which was fixed to the wall and which ticked several times a second (a rate faster than the speed of rotation of the chair.) The test was repeated, and the candidate instructed to "talk about all you feel and hear". It was noted whether the sound of the metronome enabled the candidate to report correctly the moment when he stopped turning and to recognize the after sensation of movement as being false.

In Part 3, the candidate's head was placed in a small lighted box which was fitted to his shoulders so that he could not see out. In the top of the box, but in his field of view, was a pointer, attached in such a way that it was always stationary with respect to the rest of the room. The candidate was shown that the pointer did not move when the chair was rotated and assured that "there was no trick". The test was then repeated. It was noted whether the addition of the pointer enabled the candidate to report correctly his actual movements and to recognize the after-sensation of movement as false.

Time Limit. Variable, but might be as long as 30 minutes.

16. COORDINATION TEST.

Hypothesis. This test was designed to measure ability to coordinate hands and feet in response to a pattern of visual stimuli.

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Description. Developed in 1938 after the first description of the original Macburn Serial Action Apparatus appeared in print, this test resembles the present S.A.M. Complex Coordination Test of the AAF. Conventional stick and rudder controls are used to activate rows of lights arranged as a cross with a horizontal bar across the bottom.

```
      o o
      o o
      o o
      o o
o o o o o o o o o o
o o o o o o o o o o
      o o
      o o
o o o o o o o o o o
o o o o o o o o o o
```

One light in each doubt row was lighted by an automatic control device and the task of the candidate was to match these lights by the appropriate movement of stick and rudder. The apparatus presented twenty stimulus patterns before repeating itself. A practice period was allowed during which the candidate could familiarize himself with the apparatus.

Score. Time required to make forty settings.

Alternative Administration Procedures. This test was frequently administered immediately before and after the Vertical Wheel test. This was done in order to determine whether being rotated in the wheel caused any decrement in performance on the coordination test.

The apparatus was also equipped with switches which enabled the operator to reverse the relation of the controls to the lights. The directions used when the test was used in this way were as follows:

"You should try the apparatus once more. This time, after each reaction, I shall turn the switch-over button, so that the coordination of the lights to your controls is different. You must by experimentation, determine what you must do and thereafter react. There are four possibilities which I shall show you now. (Each of the four switch-over positions will be shown and practiced. The trainee should not impress upon his memory the possible coordinations, but merely know them. After each single reaction the switch-over button will be turned by the examiner. The candidate should not know what coordination is to be used. He should find out by experimentation what he has to do in order successfully to carry through the necessary reactions)".

17. COMPLEX REACTION TEST.

Hypothesis. This test was designed to measure speed of response to a variety of visual and auditory signals requiring discriminatory reactions of both hands and feet. The variety of stimuli and controls made the task somewhat complex. Because of the pressure on the candidate to react correctly yet very rapidly, in a novel situation, the test was believed also to measure temperamental and personality characteristics. It was designed originally by Rieffer.

Description. On a screen about one meter square could be presented automatically a solid white circle, a solid red circle, a solid blue circle, the black outline of a square or the black outline of a circle. A bell or buzzer could also be sounded. The candidate was seated facing the screen at a distance of about four meters. Before him were three large hand levers and two foot pedals. One of these controls had to be operated in response to each of the different signals. One control could have more than one signal.

R E S T R I C T E D

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Stimuli were presented automatically and for only a limited interval. Whether or not the candidate responded correctly, the next signal appeared after this fixed interval. A total of 330 stimuli was presented during one sequence. Two complete sequences were usually given to each candidate.

Time Limit. Each sequence of 330 stimuli required eight minutes.

Score. Number of correct responses. Subjective observations of test behaviour were also made.

Validity. No validity data were available, but it was stated almost universally that this was the best of the tests for pilot selection.

Portable Form. A portable and revised model of the Complex Reaction Test was developed by Dr. Mierke of the German Navy. The apparatus was contained in a compact carrying case weighing less than twenty pounds total. Behind a small glass stimulus panel a red, green, yellow, blue or white light could be made to appear. The candidate wore earphones and the sound of a buzzer could be given in either ear. Five push buttons, corresponding in color to the stimulus lights, had to be pushed in response to the light signals. A right or a left toggle switch had to be thrown in response to the buzzer signals. The apparatus was capable of further variation by switching on an alternate panel of stimulus lights or a multi-colored drum, by changing the position of the five colored push buttons, and by substitution of two foot pedals for two of the buttons or for the two toggle switches. Stimuli were presented automatically for short fixed intervals of time and the score, which was scored by a counter, was the number of correct responses.

18. VERTICAL WHEEL TEST.

Hypothesis. This test was designed to determine whether a man was disturbed by being placed in a very unnatural situation.

Description. A large vertical wheel, approximately ten feet in diameter and several feet wide was used. The candidate was placed inside the wheel, facing the center, and strapped securely to the rim. In each hand was placed a reaction key. He was then blindfolded and rotated. While being rotated he was required to say when his head was down and when it was up, to react with the hand keys to auditory signals, and to solve simple problems in mental arithmetic. This Test was also used in conjunction with the Coordination Test.

Scoring. Subjective.

19. BALANCING TEST.

Hypothesis. This test was designed to measure agility.

Description. The candidate stood on an unstable platform and attempted to remain balanced and in an upright position. His coordination was observed.

Scoring. Subjective

20. SPORT TESTS.

Hypothesis. These tests were designed to measure coordination, physical agility, strength and endurance.

Description. The tests were given on an athletic field and included the following:

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100 meter run
Broad jump
Jumping over obstacles
Shot put
Chin up
Obstacle Course
3,000 meter run

In addition, boxing was sometimes included.

Scoring. A point system for each event was used from which a total score was obtained. Observations of general performance and attitude also were recorded.

21. PERSONAL QUESTIONNAIRE.

Hypothesis. This blank was used to secure personal data about the candidate.

Description. The blank comprised two double pages and contained questions regarding the age, education and health of the candidate, his parents and family background, interests (especially in technical fields), special skills, flying experience, and similar biographical information. Answers were written out on the blank.

Time Limit. Liberal. About 15 to 20 minutes was required.

Scoring. Subjective and unstandardized.

22. ANALYSIS OF HANDWRITING.

Hypothesis. Following the classic work of Klages (Graphologie von Ludwig Klages, 1932), a great deal of attention was given to studies of handwriting. Each year a special course was given in Berlin to train examiners in this art. It was believed that handwriting revealed intellectual ability, temperament, will, feeling and mood, maturity, pathological trends, and spiritual qualities, ("Nevoe").

Description. Samples of handwriting from the essays were used for this analysis.

Scoring. Subjective and unstandardized.

23. ANALYSIS OF SPEECH AND VOICE.

Hypothesis. This was part of the characterological examination.

Description. The candidate's manner of speaking, voice quality, and other speech characteristics were observed. The impressions gained in this way were used in arriving at the final analysis of personality.

24. ANALYSIS OF FACIAL EXPRESSION- MOTION PICTURES.

Hypothesis. The technique of photographing and analyzing facial expression followed the methods developed by Lersch and was employed chiefly for typological study.

Description. A camera was operated from behind a one way screen and with a masking noise so that the candidate did not know he was being filmed. Pictures were taken during an initial interview. An effort was made to create a variety of moods. At one point the candidate was required to withstand the shock from an indictorium, the strength of which was gradually

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increased until he cried stop. At another point he was required to lift a heavy weight. His facial expression was filmed during these activities.

Scoring. Subjective.

25. GROUP DISCUSSION.

Hypothesis. This test was used in the study of personality and leadership ability.

Description. The procedures used in administering the test varied. One method was to place a large picture on the wall and instruct the candidate to discuss this picture before four enlisted men "in such a way that the soldiers will contribute to the discussion". Other methods were to assign a general topic for discussion, or to have the candidate make a short talk on a semi-technical subject and then lead a discussion, afterward.

Time Limit. Variable. If the candidate did well and satisfied the examiner the test might be terminated quickly.

Scoring. Subjective. The candidate was judged on ability to express original ideas, to see things that others couldn't, and to stimulate ideas in others. Attention was paid also to personality characteristics.

26. ORDERS TEST.

Hypothesis. This test was designed to test ability to direct the activity of other men, to secure their cooperation, and to accomplish a practical task.

Description. The candidate was brought into a room in which there was an assortment of equipment and four enlisted men. He was told to take charge of the enlisted men and accomplish some practical task, such as constructing a bridge, or arranging the books in a library. Another variation of this test was for the candidate to bend a wire into a geometrical pattern, demonstrate the procedure, then have each of the soldiers make a similar pattern. Originally several observers were present, but during the war this test was given by the examiner.

Time Limit. Liberal.

Scoring. Subjective. Attention was paid not only to the outcome of the task, but to the manner of giving orders, the degree of cooperation secured from the men and the degree to which the candidate participated in the actual work himself.

27. OBSTACLE COURSE.

Hypothesis. This test afforded an opportunity for judging the motivation and determination shown by the candidate in the face of obstacles and great physical exhaustion.

Description. The candidate, dressed in full field equipment, was sent through an obstacle course. The course was such that no one could complete it. However, the candidate was expected to keep at the task until he became exhausted. He was deliberately criticised and various things were done to discourage him. After the test was over, however, he was told that he did well.

Scoring. Subjective. Special attention was paid to the candidate's willingness to keep trying even when he became exhausted, to the reserve forces he could muster, and to whether he went to pieces at the end, or retained control of himself.

RESTRICTED

R E S T R I C T E D

28. CODE APTITUDE TESTS.

Description. Two code aptitude tests were used. One was recorded on phonograph records and could be used as a group test. Candidates judged whether two groups of code sounds were the same or different. The other test was given by means of a two way key and earphone set. The examiner tapped out a signal, which the candidate attempted to repeat as exactly as possible.

Score. The score of the first test was the number of correct items. In the second test the examiner made a subjective rating of performance.

29. EXPLORATION - FINAL INTERVIEW.

Hypothesis. This interview was designed to permit the examiner to formulate a final impression of the candidate. It was scheduled last so that all of the information from the preceding tests would be available, and was supposed to provide the final opportunity for evaluating the "total personality".

Description. The interview did not follow any fixed pattern and no set questions were asked. Many of the points covered in the personal questionnaire were discussed. Special interests, likes and dislikes were explored. In the examination of officer candidates substantial emphasis was placed on cultural experiences, knowledge of art, literature, and philosophy and upon socio-economic level. Educational background was also studied carefully.

Before the war it was customary for several examiners, including the medical officer at officer recruiting centers, to attend these final interviews. During the war, however, interviews were between one examiner and one candidate.

Time Limit. Indefinite, but usually varied from 20 to 60 minutes.

R E S T R I C T E D

S E C R E T

APPENDIX XIV

BATTERY OF TESTS USED AT
LUFTG U RECRUITING CENTERS

S E C R E T

R E S T R I C T E D

APPENDIX XIV

Battery of Tests used at the Luftgau Recruiting
Center at Hamburg in 1940.

1. PILOT AND NAVIGATOR TEST BATTERY.

First Day (Group Tests):

Personal Questionnaire
Verbal Memory Test
Mental Arithmetic Test
Mathematics Test
Writing an Essay on a General Topic
Observation - Moving Picture Test
Mechanical Principles - Moving Picture Test
Mechanical Assembly Test
Code Recognition Test
Sport Tests

Second Day (Individual Tests):

Distance Perception - Horopterscope
Distance Perception - Herring's Test
Exner's Spirale
Aubert's Test
Orientation Test
Revolving Chair
Coordination Test
Vertical Wheel

Third Day (Individual Tests and Final Interview):

Complex Reaction Test
Orders Test
Exploration

2. BOMBARDIER, GUNNER AND PARATROOPER TEST BATTERY.

First Day (Group and Individual Test):

Personal Questionnaire
Verbal Memory Test
Mental Arithmetic Test
Mathematics Test
Writing an Essay on a General Topic
Mechanical Principles - Moving Picture Test
Mechanical Assembly
Code Recognition Test
Code Reproduction Test
Distance Perception - Horopterscope
Distance Perception - Herring's Test
Sport Tests

Second Day (Individual Tests and Final Interview):

Coordination Test
Vertical Wheel
Complex Reaction Test
Orders Test
Exploration

R E S T R I C T E D

S E C R E T

APPENDIX XV

PSYCHOLOGICAL REPORT

S E C R E T

21. Rate.

Annahmestelle 3
für Offizieranwärter
der Luftwaffe

4. Aufzeichnungen
3. Ausfertigung.

Std. Nr. d. R225/ Dr. III/Re.
Bearb. Nr. M 348/40.



Name **von Bergh** Vorname **Wolfgang**
(Familienname)

Geburtsdag 22.2.1921 Geb.-Ort **Bayreuth**

Prüfungstage 19.20. und 21. Juni 1939 Prüf.-Ort **München - Oberwiesenfeld.**

Beruf und Anschrift des Vaters **Hauptmann im Stab der Wehrersatz-Inspektion, U l m**
Donau.

Gemeldet für **Fliegertruppe.**

Dorgehen für

Eignungsgrad **Voll geeignet.**

Zur Ausbildung als Flugzeugführer **Geeignet.**

Abteilung.

München - O.W., den 22. Juni 1939.
(Ort)

Eignungsbeurteilung

von Bergh steht haltungs- und niveaumäßig über dem Durchschnitt seiner Alterskameraden. Er ist ein frischer, offener, stets einsatzfreudiger Junge mit soldatischer Begeisterung und soldatischem Empfinden. Der Sicherheit und Bestimmtheit der Haltung nach aussen entspricht auch innere Disziplin, Festigkeit und Beherrschtheit. So vermag er sich mühelos durchzusetzen und Geltung zu verschaffen.

Von seiner guten geistigen Begabung macht er selbständigen und regen Gebrauch. Er ist bei aller praktischen, aktiven Einstellung nicht ohne besinnliche Note, die ihn nicht nur kritisch, sondern auch einführend den Dingen nachgehen lässt. Auch für kulturell-geistige Güter und Werte ist er angeschlossen und empfänglich. Seine Arbeitsweise ist überlegt, gesammelt und sachlich, sodass ihm der entsprechende Erfolg nicht versagt bleibt.

Er wird sich als Kamerad und Führer gut bewähren.

Der Ausschuss:

Gen.: **Alsfeld.**
Obstlt. und Leiter der Annahmestelle

Gen.: **Schönger.**
Obstlt. und militärischer Mitprüfer

und militärischer Mitprüfer

Gen.: **Dr. Middendorf.**
Reg.Rat und wissenschaftlicher Prüfer

Gen.: **Dr. Arnold.**
Reg.Rat und wissenschaftlicher Mitprüfer

Für die Richtigkeit der Abschrift:

München - O.W., den 22. Juni 1939.
(Ort)

Oberstleutnant und Leiter der
Annahmestelle.

Annahmestelle 3
für Offizieranwärter
der Luftwaffe

4 Ausfertigungen:

1. Ausfertigung.

Lfd. Nr. d. B. 126 Dr.Mi/Re.

Bearb. Nr. M 174/40



Name **W e b e r** Vorname **Walter**
(Familienname)

Geburtsdag **2.3. 1922**, Geb.-Ort **N ü r n b e r g**.

Prüfung **10. 11. und 12. Mai 1939**, Prüfort **M ü n c h e n -Oberwiesenfeld**.

Beruf und Anschrift des Vaters **Kfm. Abteilungsleiter, Nürnberg-N., Heimstättenstr.8.**

Gemeldet für **Fliegertruppe**

Vorgehen für/.

Eignungsgrad **Nicht geeignet.**

Zur Ausbildung als Flugzeugführer **Nicht geeignet.**

Abchrift.

München
(Ort)

den **19. Mai 1939.**

Eignungsbeurteilung

Die intellektuell-geistigen Fähigkeiten von W e b e r sind in ganzen ausreichend. Wenn er sich über eine Sache Gedanken macht, weiss er selbständig zu urteilen und was er zum Thema vorbringt, ist überlegt und hat Hand und Fuss. Das Gesamtniveau der Persönlichkeit ist als einfach anzusprechen.

Was Weber fehlt, ist schnelle Wendigkeit und rasches Anpassungsvermögen. In seinem sehr ruhigen Temperament, das ihn leicht matt und langweilig erscheinen lässt, aktiviert er sich schwer, seine sthflüssige Wesensart lässt ihn nur langsam und allmählich zur vollen Entfaltung und zu nachhaltigen Kräfteinsatz kommen. Zumal als handelnder Mensch ist er wenig fix und gewandt. Gerade in Situationen, wo es auf schnelle Umstellung und Reaktion auf rasch wechselnde Umweltsverhältnisse ankommt, versagt er.

Charakterlich ist er offen, gefestigt und auch seinen Pflichten untersieht er sich willig und mit Hingabe. Die Hauptbedenken bei Weber richten sich gegen seine Einstellung speziell bei der Fliegertruppe. Da er jedoch an einer Übernahme als Fahnenjunker bei anderen Waffengattungen keinerlei Interesse hat, sondern ausschliesslich eine fliegerische Verwendung anstrebt, muss bei ihm von einem Vorschlag als Fahnenjunker bei der Luftwaffe abgesehen werden.

Obstl. und Leiter der Annahmestelle

Hauptm. und militärischer Mitprüfer

und militärischer Mitprüfer

Der Auspruch:

Reg.Rat und wissenschaftlicher Prüfer

Reg.Rat und wissenschaftlicher Mitprüfer

Für die Richtigkeit der Abschrift:

München
(Ort)

den **19. Mai 1939.**

S E C R E T

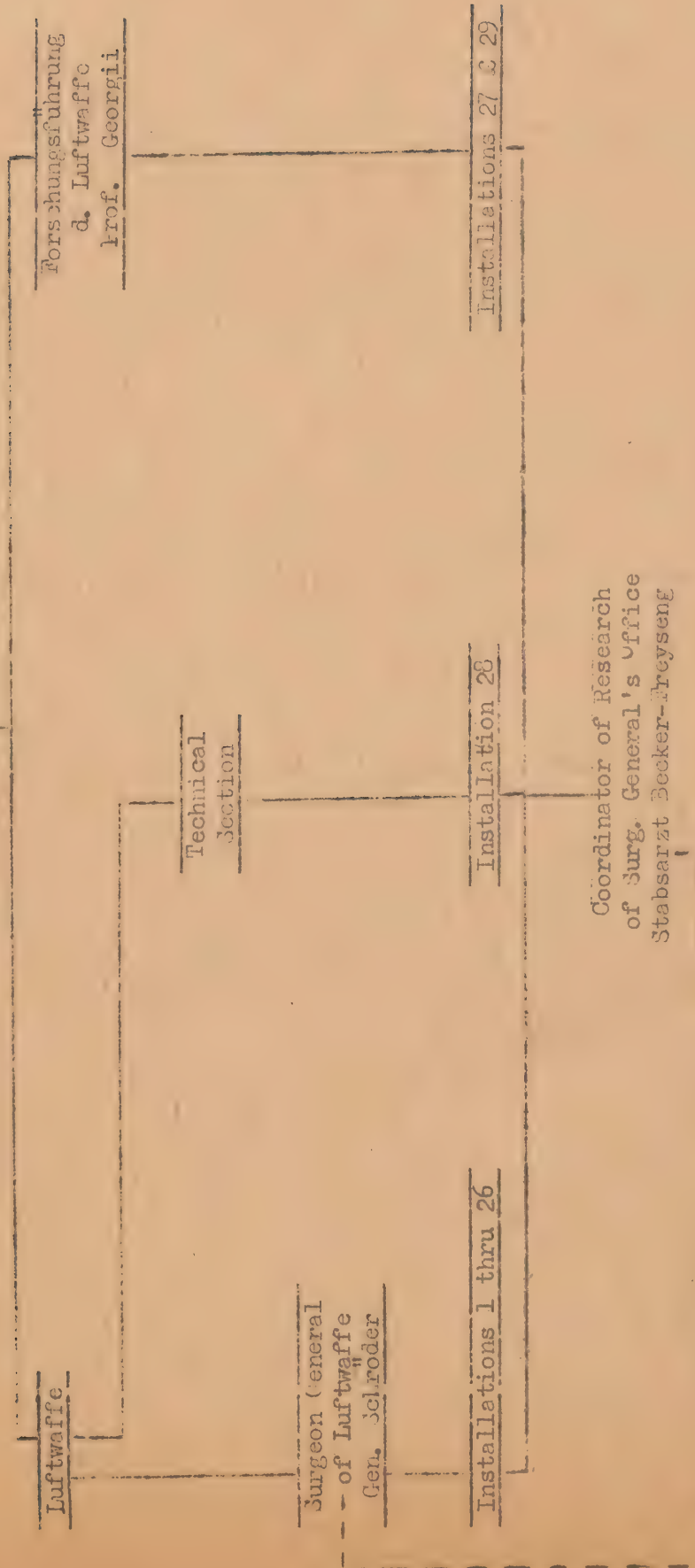
APPENDIX XVI

ORGANIZATION OF NERO-MEDICAL RESEARCH
OF GERMANY

S E C R E T

ORGANIZATION OF AERO MEDICAL RESEARCH OF GERMANY

AIR MINISTRY



If Installation involved use of Ministry of Education funds, facilities and personnel, there was also coordination with that ministry.

(See next page)

S E C R E T

APPENDIX XVII

RESEARCH INSTALLATIONS

S E C R E T

RESEARCH INSTALLATIONS

- *1. Luftfahrtmedizinisches Forschungsinstitut des RLM Berlin NW 40
Scharnhorststrasse 35. (Prof. Strughold)
- *2. Aussonstello des Luftfahrtmedizinischen Forschungsinstitut Berlin.
Brannenburg am Inn (Dr. Dörmann)
- *3. Physiologisches Institut Göttingen. (Prof. Rein)
- *4. Aussonstello für Gehirnforschung des Luftfahrtmedizinischen Forschungsinstitut
Berlin im Kaiser-Wilhelm-Institut für Hirnforschung, Berlin-Buch (Prof. Spatz
z. Zt. München)
- *5. Aussonstello des Luftfahrtmedizinischen Forschungsinstituts Berlin
Physiologisches Institut Heidelberg. (Dr. Gauer).
6. Sanitätsversuchs-und Lehrgruppe, Jüterbog, Altes Lager (Prof. Knothe)
7. Institut für Luftfahrtmedizin, München (Prof. Woltz).
8. Institut für Luftfahrtmedizin Hamburg-Eppendorf (Dr. Schwarz).
9. Kaiser-Wilhelm-Institut für Arbeitsphysiologie Dortmund (Prof. Lehmann).
10. Physiologisches Institut Köln (Prof. Schneider).
11. Fliegeruntersuchungsstello der Med. Klinik Freiburg/Breisgau (Dezent Dr. Frey).
12. Institut für Luftfahrtmedizinische Pathologie d. RLM am Pathologischen
Institut der Universität Freiburg/Breisgau (Prof. Buchner)
13. Physiologisches Institut Breslau, Fliegeruntersuchungsstello (Dr. Kreinberg)
14. Physiologisches Institut Prag (Prof. Schubert)
15. Physiologisches Institut Leipzig und Gebirgs-sanitätsschule St. Johann in Tirol.
16. Korchkoff-Institut Bad Nauheim (Prof. Schaffer)
17. Physiologisches Institut Gießen (Prof. Eb. Koch)
18. Kaiser-Wilhelm-Institut für Biochemie Berlin-Dahlem (Dr. Unstruth)
19. Physiologisches Institut Bonn (Prof. Frenkel z. Zt. am Hamburger Korchkoff
Institut)
20. Pharmakologisches Institut Innsbruck (Prof. Jarisch).
21. Prof. v. Biringhausen, Frankfurt/ am Main (Aufenthalt unbekannt).
22. Medizinische Klinik Köln-Lindenthal (Prof. Knipping, Dr. Zaepfel, Dr. A. K. Koch)
23. Physiologisch. Chemisches Institut Berlin und Physiologisch-Chemisches
Institut Tübingen (Dr. Leiner).
24. Augenklinik Gießen (Prof. Kyriakidis)
25. Augenklinik Rostock (Prof. Braun)
26. Physiologisches Institut Posen (Prof. Lonje Aufenthalt unbekannt).
27. Institut für Flugmedizin der deutschen Versuchsanstalt für Luftfahrt Berlin-
Adlershof (Dr. Ritz)
28. Erprobungsstello der Luftwaffe, Rechlin.
29. Medical Research Institut Garvitch-Partenkirchen (Henschke).

NOTE: Those marked * were directly under Professor H. STRUGHOLD.

STAFF OF LUFTFAHRT UND MISZELLENS FORSCHUNGSINSTITUT RM.

unter Prof. (Oberstarzt) STRUGHOLD

- Dr. Glömann, H.C. (Druckturzversuche, Druckkammerflugzeuge, Konstruktion von Unterdruckkammern).
- Dr. Luft, U. (Höhenaklimatisation, Sauerstoffatmung in grossen Höhen)
- Dr. Opitz, E. (Akuter Sauerstoffmangel)
- Dr. Palao, F. (Elektroencephalographie)
- Dr. Gaucier, O. (Accélération, Zentrifugenkonstruktion)
- Dr. Hanson, H. (Fliegerrisiko in warmen Ländern und grossen Höhen)
- Frs. Dr. Schmidt, I. (Farbsehen, Nachtssehen, Bibliographie)
- Dr. Boso, H. (Brillen, Nachtssehen, Tiefensehen).
- Prof. Schütz, E. (Elektrokardiographie).
- Dr. Dosage (Luftschutzfragen).
- Dr. Autrum H. (Elektroretinographie, Kernphysik).
- Dr. Denzer, H. (Vergleichende Physiologie, Mikro-Unterdruckkammer).
- Dr. Suchalla, H. (Wissenschaftliche Fragen des Versuchstiermaterials und Versorgung der wissenschaftlichen Institut und pharmazeutischen Industrie mit Versuchstieren)
- Dr. Becker-Freyberg
bis Anfang 1944 (hoher Sauerstoffdruck)

S E C R E T

APPENDIX XVIII

LIST OF ALTITUDE CHAMBERS

S E C R E T

ALTITUDE AND CLIMATE CHAMBERS
BUILT OR RENOVATED BY J. V. ZEUZEM

Code to model

U.K. Without lock
U.K.S. With lock
T. Temperature
K. Climate

Built for the Luftwaffe - Stationary

<u>No.</u>	<u>Town & Location</u>	<u>Size</u>	<u>Model</u>	<u>Year</u>
1.	Kerhoff-Institut, Bad-Nauheim (übernommen)	3,00	U.K.	1930
2.	Ausstellungskammer Luftfahrt-Museum Berlin	3,00	U.K.S.	1934
3.	Kriegsschule Dresden-Kletzsche	3,00	U.K.S.	1935
4.	Kerhoff-Institut Bad-Nauheim (Umbau)	1,50	S	1935
5.	Universitätsklinik Jena	3,00	K.K.S.	1936
6.	Ausstellungskammer Strahlen und Heilkunde München	3,00	K.K.S.	1936
7.	Universitätsklinik Freiburg/brsg.	3,00	K.K.S.	1936
8.	Olympiade Berlin, später Garnisonslazarett	1,50	K.K.	1936
9.	Physiologisches Institut Göttingen	3,00	T.K.S.	1937
10.	Physiologisches Institut München	3,00	K.K.S.	1937
11.	Universitätsklinik Kiel	3,00	K.K.S.	1937
12.	Fliegerhorst Detmold	3,00	U.K.S.	1938
13.	Universitätsklinik Breslau	3,00	U.K.S.	1938
14.	Luftwaffenlazarett Braunschweig	3,00	K.K.S.	1938
15.	Universitätsklinik Halle	3,00	K.K.S.	1938
16.	Luftwaffenlazarett Halle	3,00	K.K.S.	1938
17.	Universitätsklinik Wien	3,00	K.K.S.	1938
18.	Deutsche Versuchsanstalt Berlin	3,00	T.K.S.	1938
19.	" " "	1,00	U.U.T.	1938
20.	Universitätsklinik Kiel	1,00	U.U.T.	1938
21.	Physiologisches Institut Giessen	3,00	K.K.S.	1939
22.	Fliegeruntersuchungsstelle Frankfurt a.M.	3,00	K.K.S.	1939
23.	Luftwaffenlazarett Nürnberg	3,00	K.K.S.	1939
24.	Universitätsklinik Prag	3,00	K.K.S.	1939
25.	Luftwaffenlazarett Frankfurt a.M.	3,00	K.K.S.	1940
26.	Luftwaffenlazarett Greifswald		K.K.S.	1940
27.	Universitätsklinik Köln-Lindenburg	3,00	T.K.S.	1940
28.	Phatolog.Institut Heidelberg	1,50	U.K.	1942
29.	Prof. Eichholz, Heidelberg	1,50	K.K.	1942
30.	Segelflieger Forschungsstelle Ainring	3,00	K.K.S.	1942
31.	Luftfahrtmed.Forschungsstelle Freising	4,00	U.K.S.	1944
32.	" " "	0,70	Sturz	1944
33.	Luftwaffenlazarett Gotha	1,50	K.K.	1938

MOBILE DECOMPRESSION CHAMBER FOR THE AIR FORCE

No.	Town and Location	Size	Model	Year
34.	4 Stück fahrbare Unterdruk-Motorisierte Züge, mit Sturzkammer, Notstromaggregat, Zugmaschine mit 2 Stück Spezialwagen.			

Rebuilt Russian Stationary Chambers

No.	Type and Serial No.	Delivered to	Decompression	Year
1.	Russo U. 1 E/St. Nr. 7053	Oranienburg	144,5 mm Hg	1943
2.	Russo U. 1 E/St. Nr. 7056 T.Kühl	St. Johann	144,5 " "	"
3.	Russo U. 1 E/St. Nr. 7057	Ahlberg	144,5 " "	"
4.	Russo U. 1 E/St. Nr. 7058	Jever, dann Ditz	144,5 " "	"
5.	Russo U. 1 E/St. Nr. 7059	Husum	144,5 " "	"
6.	Russo U. 1 E/St. Nr. 7060	Strakon	144,5 " "	"
7.	Russo U. 1 E/St. Nr. 7061	Jüterbog	144,5 " "	"
8.	Russo U. 1 E/St. Nr. 7056 T.Kühl	St. Johann	144,5 " "	"
9.	Russo U. 1 E/St.	DVL Berlin Adlershof	144,5 " "	"

PRIVATE DELIVERY OF CLIMATIC & DECOMPRESSION CHAMBERS

Nr.	1	Eigene Versuchsanlage Frankfurt a.H.	1,50	K.K.	1928
"	2	Krankenhaus Romscheid	1,50	"	1930
"	3	Dr. Stucky, Frankfurt a.H.	1,50	"	1931
"	4	Dr. Goldberg, Wiesbaden	1,50	"	1932
"	5	Ausstellungskammer Wiesbaden	1,50	"	1932
"	6	Ausstellung Kampf den Vorderb Köln	1,50	"	1933
"	7	Stadt. Klinik Dusseldorf (Prof. Knipping)	3,00	"	1934
"	8	Dr. Sandrowsky Berlin	1,50	"	1934
"	9	Berlonfein, Mannheim	1,50	"	1935
"	10	Dr. Breitmaier, Kiel (Sanatorium)	1,50	"	1935
"	11	Kupferberg (Klimaanlage Seelhauling)			1935
"	12	Dr. Happich, Darmstadt	1,50	"	1936
"	13	Sanatorium Ebersteinburg	1,50	"	1937
"	14	Adlerwerke (Thermokasten)			1938
"	15	Kaiser Wilhelm-Institut, Frankfurt a.H.	1,50	"	1940
"	16	Burgdloff, Sofia, Bulgarien	1,50	"	1940
"	17	Auerwerke Berlin-Oranienburg	3,00	U.K.G.	1942
"	18	Reichspost Versuchsanstalt, Berlin	1,50	T.Kühl	1942
"	19	Park Sanatorium Bad Nauheim	1,50	K.K.	1940
"	20	Klinik in Secod Ungarn	1,50	K.K.	1943
"	21	Boldrini, Mailand Italien	1,50	K.K.	1942

REBUILT RUSSIAN MOBILE UNITS

No.	Type and Serial No.	Delivered to:	Decompression	Year
1.	Russe rund 2 St.	L. 36790 Brüssel	14,5 mm Hg	1943
0	Nr. 7050, 5,50 ø			
2.	Russe rund 2 Stck.	Dr. Auftreter	" " "	"
	Nr. 7051, 150 ø	Oberarzt		
3.	Russe rund 2 Stck.	L. 00343 Hamburg	" " "	"
	Nr. 7052 1,50 ø			
4.	Russe E/ 2 Stck.	Dr. Baader	" " "	"
	Nr. 7054 1,50 ø			
5.	Russe E/ 2 Stck	Obergofr. Schwabo	" " "	"
	Nr. 7055 E/150 ø			
6.	Russe E/2 Stck	Stabsarzt Weimann	" " "	"
	Nr. 7062, 1,50 ø			
7.	Russe E/2 Stck	L. 09748	" " "	"
	Nr. 7063, 1,50 ø			
8.	Russe E/2 Stck.	L. 54605 Berlin	" " "	"
	Nr. 7064, 1,50 ø			
9.	Russe E/2 Stck.	Bad-Zwischonahn	" " "	"
	Nr. 7065 1,50 ø			

Foreign deliveries

Hungary

1.	Budapest Aerodynam.Versuchsanstalt	4.00	K.K.S.	1940
2.	" " " Animal	1.00	U.K.	1941
3.	Führbare Krananlage mit Kühlanlage (Mobile unit with refrigeration)			

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Italy

4.	Mailand Ital.Luftwaffe			
	Guidonia bei Rom	4.00	T.K.S.	1941

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Bulgaria

5.	Flughafen radobna bei Sofia	3,00	T.K.S.	1941
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Spain

6.	Sevilla Span. Luftwaffe	3,00	U.K.S.	1941
7.	" " " Animal	1,00	U.K.	1941
8.	Madrid " " & explosive	4,00	T.K.S.	1942
			decompression	
9.	" " " Animal	1,00	U.K.	1942

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Jugoslavia

10	Flughafen Sarlin (Zornun)	3,00	K.K.S.	1940
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Rebuilt Flughafen Lo Bouget